

**APPENDIX B**

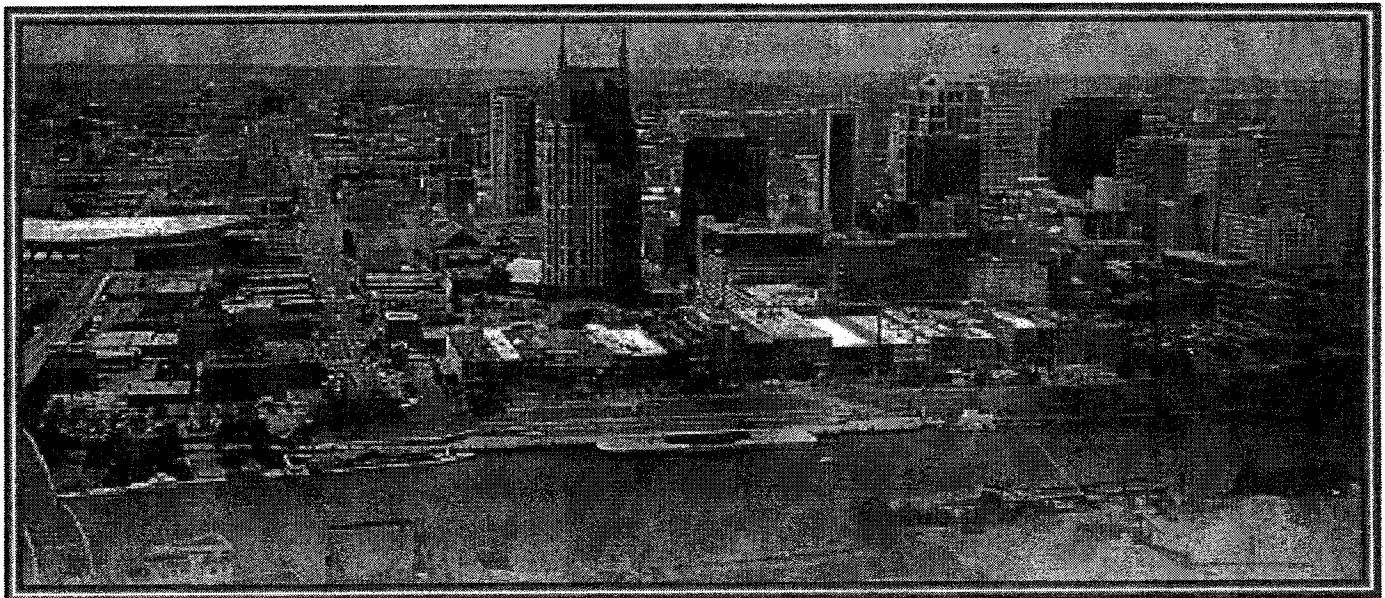
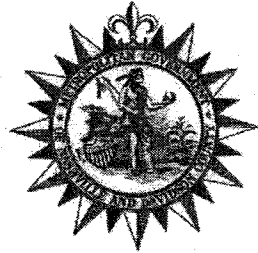
**CMOM SELF-ASSESSMENT**

1997

Metropolitan Government of  
Nashville and Davidson County,  
Tennessee

**EPA CMOM Self-Assessment  
Report**

September 2006



*Report*

# Executive Summary

## Introduction

In February 2006, the Metropolitan Government of Nashville and Davidson County Tennessee (Metro) and several other municipalities/utilities in Central Tennessee were invited by the United States Environmental Protection Agency (EPA) Region IV to conduct a self audit of their respective wastewater collection systems as part of EPA Region IV's Capacity, Management, Operations, and Maintenance (CMOM) Program. The EPA conducted an informational meeting in March 2006 during which the EPA explained the CMOM self assessment program. Metro decided to participate in the program and notified the EPA of that decision.

This document is a result of Metro's self audit and contains information requested by the EPA and represents Metro's assessment of how the wastewater system is managed, operated and maintained. The information is organized according to the format outlined in the September 2003 *EPA Region 4 Guide to Collection and Transmission System Management, Operation and Maintenance, Version 1.0*. Every effort has been made to include data that is pertinent to this audit, however, if it is determined that additional information important to the reviewer is required, Metro will make every effort to provide the needed information in a timely manner.

## Regulatory Framework

Tennessee Department of Environment and Conservation (TDEC) and the EPA believe that inadequate management, operation, and maintenance of wastewater collection systems are the greatest causes of SSOs. These are referred to as "avoidable" SSOs, which can result from a variety of causes including, but not limited to, excessive infiltration and inflow, pumping station failures, insufficient system capacity, and hydraulic restrictions caused by tree roots, debris accumulation, collapsed pipes, and excessive grease. In an attempt to reduce the number and volume of "avoidable" SSOs, the EPA has implemented the EPA Region IV CMOM program.

The purpose of a CMOM program is to optimize labor, materials, money, and equipment to manage a system's human and material resources as effectively as possible while achieving regulatory compliance by reducing the number of SSOs. Some of the benefits of a CMOM program are:

- Ensuring the availability of facilities and equipment as designed.
- Maintaining the reliability of the equipment and facilities to ensure 24 hour a day, 7 days per week, 365 days per year operation as the system was designed.

- Maintaining the value of the capital investment.

The premise of the CMOM program is that when a utility incorporates good business principles into its organization, its wastewater collection system will meet the intended performance standards and result in fewer SSOs. In general, the CMOM program places the burden of proof on the system owner to demonstrate that by using pipes, pumps and infrastructure with adequate capacity, and properly managing, operating and maintaining the system, SSOs are being prevented to the maximum extent practical.

A comprehensive CMOM program is comprised of individual management, operation, and maintenance programs, each of which:

- is specific to, and tailored for, the utility's infrastructure;
- has a written purpose explaining why the program is needed;
- has specific written goal(s) establishing the accomplishments desired for the current fiscal year;
- has the details of activities and procedures that are followed to implement the program written down in the form of Standard Management Procedures (SP), Standard Operating Procedures (SOP), and/or Standard Maintenance Procedures (SMP) that are used by the utility's personnel;
- is implemented by well-trained personnel;
- has established appropriate performance measures which are tracked by management; and,
- has a written procedure requiring periodic review, evaluation, and any necessary revision.

The purpose of this CMOM Self Assessment is to allow Metro Water Services (MWS) to evaluate the performance of existing management, operations and maintenance procedures relevant to existing sewer collection and transmission systems and to identify deficiencies and establish corrective action items.

## System Background

Beginning in 1823, brick and clay sewers were constructed and conveyed both storm water and sanitary sewer for discharge into the Cumberland River. The cholera epidemic of 1884 brought on a flurry of sewer construction. The first major trunk sewer in Nashville was the Wilson Spring Branch, which extends from Lafayette and 7<sup>th</sup> Avenue, South, to the river at the foot of Broadway.

By 1950, as Davidson County's population grew to more than 300,000, the discharge of untreated wastewater and failure of septic systems represented a significant threat to the environment and a challenge for a growing community. The sewer system had evolved to nearly 400 miles of sanitary sewer lines that emptied into a network of combined sewers, which

discharged directly into streams and the river. The need was recognized for a system that would capture and treat the sewage.

The Central Wastewater Treatment Plant was built just north of downtown and began operation in 1958. The Dry Creek Wastewater Treatment Plant was built in the Rivergate area 20 miles north of downtown Nashville and began operation in 1961. The Whites Creek Wastewater Treatment Plant in West Nashville was placed in service in 1975.

The 1980s marked the beginning of an aggressive sewer expansion program to help eliminate more septic systems in Davidson County. Even with three treatment plants, this aggressive expansion resulted in a need for additional improvements to control overflows that resulted from the amount of excess water entering the sewer system during rain events.

Through a series of water quality modeling studies that began in 1975, MWS gained considerable knowledge of the response of the Cumberland River to not only MWS's discharges but also to urban, rural and natural sources of pollution.

In 1990, the Overflow Abatement Program (OAP) began as an aggressive program with the goals of eliminating sanitary sewer system overflows attributed to rainfall and the application of best management practices to the combined sewer system to minimize public health impacts caused by rainfall induced overflows. MWS has spent more than \$620 million on OAP projects to date; more than \$179 million is planned for projects that are either in planning or design stages.

Tremendous progress has been made toward improving water quality in the Cumberland River watershed as a result of the OAP. Continuous study since 1988 has given MWS a wealth of water quality data. This data provides a detailed picture of the conditions before extensive CSO remediation efforts were completed as well as the dynamic changes that have taken place as solutions have been implemented.

MWS's sewer system now serves an area of approximately 472,700 acres with a population of 659,923. The system has approximately 2,750 miles of gravity sewer lines and 150 miles of force main in the ground ranging in sizes from less than 8" to over 24" in diameter, over 74,000 manholes, 101 pump stations and three wastewater treatment plants. The system serves 171,341 customers; of which 12,732 are commercial and 599 are industrial. There are also 21,688 customers in satellite municipalities or utility districts.

The average daily flow of wastewater for the past year (August 2005 - July 2006) transmitted to the three wastewater treatment plants was 120.7 MGD. MWS operates with a staff of 666 full-time employees for both water and wastewater operations. The annual operating budget is approximately \$82.0 million with \$50.1 million allocated for wastewater.

The Self-Assessment report includes information compiled by MWS on each of the 24 focus areas plus additional areas for CSOs. Each area was divided into various programs for closer evaluation. The performance of each program and the goals associated with the program were reviewed to determine any areas in need of improvement. Reference documents are attached in the appendices.

The completion of this 2006 Self-Assessment proved to be beneficial to MWS in analyzing current policies and procedures used by MWS pertaining to the wastewater collection and treatment system. MWS identified programs which were adequate as they are currently managed as well as programs where some improvements are needed. Proposed recommendations can be reviewed in detail in **Section 8 Program Recommendations, System Rehabilitation and Needs, and Rehabilitation Schedule.**

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# Acronym and Abbreviation List

BAR	Budget Accountability Report
BETTER	Box Exchange Transport Temperature and Ecology
BOD	Biological oxygen demand
CAFR	Comprehensive Annual Financial Report
CCTV	Closed circuit television
CDL	Commercial drivers license
CIB	Capital Improvement Budget
CIS	Customer Information Systems
CIU	Categorical industrial user
CMMS	Computerized Maintenance and Management Systems
CMOM	Capacity, Management, Operations, and Maintenance Program
CPS	Central Pumping Station
CSC	Customer Services Center of MWS
CSO	Combined sewer overflow
CSS	Combined sanitary sewer
CSSAP	Continuous Sewer System Assessment Program
CWSRF	Clean Water State Revolving Fund
DROP	Departmental Review of Performance
EPA	Environmental Protection Agency
FLSA	Federal Labor Standards Act
FOG	Fats, Oils, and Grease Control Program
FSE	Food service establishments
GCE	Grease control equipment

GI	Grease interceptor
GIS	Geographic Information System
H <sub>2</sub> S	Hydrogen sulfide
HR	Human Resources Division of MWS
ICS	Incident Command System
IDU	Intermediate drainage units
I/I	Infiltration/inflow
IMS	Information Management System
IPP	Industrial Pretreatment Program
ITS	Information technology service
IS	Information Services Section
LOCAP	Local Cost Allocation Plan
MARA	Multiple Antibiotic Resistance Analysis
Metro	Metropolitan Government of Nashville and Davidson County
MPC	Metropolitan Planning Commission
MWS	Metro Water Services
OAP	Overflow Abatement Program
O&M	Operations and Maintenance
OFM	Office of Fleet Management
Ops	Operations Division of MWS
OSHA	Occupational Safety and Health Administration
PILOT	Payment in Lieu of Taxes
PLC	Programmable logic controller
PM	Preventative maintenance
PPC	Plant Protection Criteria

PPE	Personal protection equipment
PSM	Process Safety Management
RMP	Risk Management Program
RTU	Remote terminal unit
SCADA	Supervisory control and data acquisition
SIU	Significant industrial user
SMP	Standard maintenance procedures
SOP	Standard operating procedures
SSD	System Services Division
SSO	Sanitary sewer overflow
SSS	Separated sewer system
SP	Standard management procedures
SR	Service request
TDEC	Tennessee Department of Environment and Conservation
TLDA	Tennessee Local Development Authority
TOC	Tennessee One-Call
TOSHA	Tennessee Occupational Safety and Health Act
TSS	Total suspended solids
USGS	United States Geological Survey
WCMP	Wastewater Capacity Management Plan
WWTP	Wastewater treatment plant



## Section 1

### Certification by Responsible Officer of Utility

I certify that:

- (1) I have personally examined and am familiar with the information submitted with regard to the CMOM Self-Assessment Report and all documents submitted therewith;
- (2) to the best of my knowledge and belief, based on my inquiry of those individuals immediately responsible for obtaining the information, the submitted information is true, accurate and complete;
- (3) the document(s) submitted to U.S. EPA Region IV September 2006, are complete and authentic, unless otherwise indicated; and,
- (4) the principle executive officer of the municipality/authority has been notified of the CMOM Self-Assessment Report.

I am aware that there are significant penalties for submitting false information, including the possibility of fines or imprisonment.

\_\_\_\_\_  
Scott Potter, Director

22 Sep 06  
\_\_\_\_\_  
Date

\_\_\_\_\_  
Hal Balthrop, Assistant Director

9-22-06  
\_\_\_\_\_  
Date

## Section 2. System Profile and Performance History

The following is a summary of the collection system components and the performance history.

### I. Collection System Components:

- Service Area..... 472,700 acres<sup>1</sup>
- Population Served ..... 659,923<sup>2</sup>
- Total 2007 Capital Improvement Budget ..... \$66.9 million
  - Wastewater Allocation.....\$11.5 million
  - OAP Allocation.....\$21.3 million
- Total 2007 Operation and Maintenance Budget..... \$82.0 million
  - Waste Water Allocation .....\$50.1 million
- Average Wastewater Daily Flow(August 2005 – July 2006)..... 120.7 MGD
- Total Customers..... 171,341<sup>2</sup>
  - Residential ..... 136,322<sup>2</sup>
  - Small Commercial ..... 7,920<sup>2</sup>
  - Intermediate Commercial ..... 4,812<sup>2</sup>
  - Industrial ..... 599<sup>2</sup>
  - Other Utilities..... 9<sup>2</sup>
  - Madison<sup>3</sup> ..... 15,551<sup>2</sup>
  - Goodlettsville<sup>3</sup> ..... 2,369<sup>2</sup>
  - Nolensville/College Grove<sup>3</sup> ..... 2,814<sup>2</sup>
  - Lakewood ..... 945<sup>2</sup>
- Total number of employees (excluding stormwater employees) ..... 666
  - Number of employees designated for wastewater ..... 428
- Approximate miles of piping..... 2,900
  - Gravity Lines (miles)..... 2,750
    - 8" diameter or less ..... 2150
    - 10" – 24" diameter ..... 450
    - >24" diameter ..... 140
  - Force Mains (miles) ..... 150
    - 8" diameter or less ..... 60
    - 10" – 24" diameter ..... 60
    - >24" diameter ..... 30

- Age of the system<sup>4</sup>
  - Combined System (miles) ..... 224
    - 1900-1924..... 74
    - 1925-1949..... 63
    - 1950-1974..... 74
    - 1975-2002<sup>4</sup> ..... 13
  - Separate System (miles) ..... 2,676
    - 1900-1924..... 25
    - 1925-1949..... 150
    - 1950-1974..... 1171
    - 1975-2002<sup>4</sup> ..... 1146
    - 2002-present..... 184
- Number of Manholes ..... 74,560
- 101 pump stations (See Table 2-1.)

Unless specified, all values FY2006

<sup>1</sup>Based on 1996 demographic profile

<sup>2</sup>Values FY2005

<sup>3</sup>These customers are not billed by MWS

<sup>4</sup>Data from 2002 study; 2002 to present data extrapolated from total miles of piping

**Table 2-1 MWS Wastewater Pump Stations**

Pump Station	Plant	Backup Power		Primary Pump Size		Secondary Pump Size		Total GPM	Total Number of pumps
		Type	Type	#	GPM	#	GPM		
Airpark East	Central	Stationary Generator	Propane	2	110			110	2
Alice Road	Central	Portable Generator	Diesel	2	175			175	2
Banbury Crossing	Central	Portable Generator	Diesel	2	95			95	2
Baronswood Drive	Central	Portable Generator	Diesel	2	100				
Beacon Hill	Central	Portable Generator	Diesel	2	180			180	2
Bell Road	Central	Portable Generator	Diesel	2	500			500	2
Bent Creek	Central	Portable Generator	Diesel	2	300				
Berwick Trail	Dry Creek	Portable Generator	Diesel	2	400			400	2
Birchwood	Central	Portable Generator	Diesel	2	80				
Bonnafair	Central	Stationary Generator		2	2,000			2,000	2
Bordeaux Hills	Whites Creek	Stationary Generator	Diesel	2	1,575	2	750	2,325	4
Bordeaux Hospital	Whites Creek	Portable Generator	Diesel	2	500			500	2
Brandywine Pointe	Central	Portable Generator	Diesel	2	140			140	2
Brentwood	Whites Creek	Stationary Generator	Diesel	2	4,700	2	2000, 2950	6,700	4
Brentwood Villa	Central	Portable Generator	Diesel	2	100			100	2
Browns Creek	Central	Dual Feed		4	40,000			40,000	4
Buena Vista	Whites Creek	Portable Generator	Diesel	2	280			280	2
Cabin Hill	Central	Portable Generator	Diesel	3	2,000	1		2,000	4
Caleb's Chase	Central	Portable Generator	Diesel	2	80			80	2
Chatham Pointe	Central	Portable Generator	Diesel	2	250			250	2
Clearlake Drive	Central	Stationary Generator	Diesel	2	380			380	2
Cleeces Ferry	Whites Creek	Stationary Generator		2	1,500			1,500	2
Clover Bottom	Central	Portable Generator	Diesel	2	900			900	2
Cockrill Bend	Whites Creek	Portable Generator	Diesel	2	400			400	2
Countryside Drive (N1)	Central	Portable Generator	Diesel	2	200			200	2
Cowan Street	Central	Portable Generator	Diesel	3	4,719			4,719	3
Davidson Branch	Whites Creek	Stationary Generator	Diesel	3	1,300			1,300	3

### MWS Wastewater Pump Stations

Pump Station	Plant	Backup Power		Primary Pump Size		Secondary Pump Size		Total GPM	Total Number of pumps
		Type	Type	#	GPM	#	GPM		
Dodson Chapel	Central	Stationary Generator	Diesel	3	4,800			4,800	3
Donelson Plaza	Central	Portable Generator	Diesel	2	400			400	2
East Lakemont	Central	Portable Generator	Diesel	2	70			70	2
Edinburgh	Whites Creek	Portable Generator	Diesel	2	125			125	2
Fairway Center	Central	Portable Generator	Diesel	2	510			510	2
Farmingham Woods	Central	Portable Generator	Diesel	2	180			180	2
Gail Drive	Dry Creek	Portable Generator	Diesel	2	120			120	2
Germantown	Whites Creek	Portable Generator	Diesel	2	100			100	2
Gibson Creek	Dry Creek	Stationary Generator	Diesel	3	6,640	2	2,220	8,860	5
Harbourtown	Central	Stationary Generator	Diesel	2	900			900	2
Harpeth Trace No. 1	Whites Creek	Portable Generator	Diesel	2	130			130	2
Harpeth Trace No. 2	Whites Creek	Portable Generator	Diesel	2	100			100	2
Heartland Drive	Central	Portable Generator	Diesel	2	100			100	2
Hickory Hills	Central	Portable Generator	Diesel	2	85			85	2
Hickory Hollow	Central	Portable Generator	Diesel	2	350			350	2
Hidden Acres	Dry Creek	Portable Generator	Diesel	2	260			260	2
Hillview	Central	Portable Generator	Diesel	2	80			80	2
Holiday Travel Park	Central	Portable Generator	Diesel	2	825			825	2
Hopedale	Central	Stationary Generator	Diesel	2	150			150	2
Hurricane Creek	Central	Stationary Generator	Diesel	2	10,600	2	4,200	14,800	4
Joelton	Whites Creek	Portable Generator	Diesel	2	275			275	2
Lakeshore	Central	Portable Generator	Diesel	2	325			325	2
Lakeside Cove	Central	Stationary Generator		2	125			125	2
Lakeview Drive	Central	Portable Generator	Diesel	2	170			170	2
Lakewood	Dry Creek	Portable Generator	Diesel	2	260			260	2
Lankford Farms	Central	Portable Generator	Diesel	2	120			120	2
Longhunter chase	Central	Portable Generator	Diesel	2	200			200	2
Loves Branch	Dry Creek	Portable Generator	Diesel	2	1,550			1,550	2

### MWS Wastewater Pump Stations

Pump Station	Plant	Backup Power		Primary Pump Size		Secondary Pump Size		Total GPM	Total Number of pumps
		Type	Type	#	GPM	#	GPM		
Madison Heights	Dry Creek	Portable Generator	Diesel	2	50			50	2
McCrory Creek	Central	Stationary Generator	Diesel	4	5,800			5,800	4
Metro Center	Central	Portable Generator	Diesel	3	1,100			1,100	3
Mills Creek	Central	Portable Generator	Diesel	2	1,100			1,100	2
Mt. View Ridge	Central	Portable Generator	Diesel	2	135			135	2
Munn Road	Central	Portable Generator	Diesel	2	680			680	2
Neely's Bend	Dry Creek	Stationary Generator	Diesel	3	900			900	3
Old Hickory	Dry Creek	Stationary Generator	Diesel	3	2,000			2,000	3
Old Hickory Hills	Central	Stationary Generator	Propane	2	320			320	2
Oldham Drive (N4)	Central	Portable Generator	Diesel	2	80			80	2
Pawnee Trail	Dry Creek	Portable Generator	Diesel	2	255			255	2
Penn Meade	Central	Portable Generator	Diesel	2	700			700	2
Peppertree	Central	Portable Generator	Diesel	2	330			330	2
Plantation Walk	Central	Portable Generator	Diesel	2	130			130	2
Rainbow Terrace	Dry Creek	Portable Generator	Diesel	2	30			30	2
Rhonda Lane	Whites Creek	Portable Generator	Diesel	2	45			45	2
River Drive	Whites Creek	Portable Generator	Diesel	2	650			650	2
River Retreat	Dry Creek	Stationary Generator	Diesel	3	1,550			1,550	3
Riverside Drive	Central	Portable Generator	Diesel	2	450			450	2
Robertson Road	Whites Creek	Portable Generator	Diesel	2	280			280	2
Rolling Hills Drive #1 (N2)	Central	Portable Generator	Diesel	2	75			75	2
Rolling Hills Drive #2 (N3)	Central	Portable Generator	Diesel	2	25			25	2
Shelby Park	Central	Portable Generator	Diesel	3	5,500			5,500	3
Shutes Lane	Central	Portable Generator	Diesel	2	250			250	2
Smith Springs	Central	Stationary Generator	Diesel	3	3,500			3,500	3
South Lebanon Road	Central	Portable Generator	Diesel	2	150			150	2
South Oak Hill	Central	Portable Generator	Diesel	2	100			100	2

MWS Wastewater Pump Stations									
Pump Station	Plant	Backup Power		Primary Pump Size		Secondary Pump Size		Total GPM	Total Number of pumps
		Type	Type	#	GPM	#	GPM		
South Shores	Central	Stationary Generator	Propane	2	454			454	2
Summerfield	Central	Portable Generator	Diesel	2	1,050			1,050	2
Sunliner Drive	Whites Creek	Portable Generator	Diesel	2	200			200	2
The Lakes	Central	Portable Generator	Diesel	2	280			280	2
Town Village	Central	Portable Generator	Diesel	2	500			500	2
Twenty-Eighth	Central	Stationary Generator	Diesel	3	11,500			11,500	3
Vandiver	Dry Creek	Stationary Generator	Diesel	3	1,300			1,300	3
Villa's of Lakemeade No.1	Dry Creek	Portable Generator	Diesel	2	150			150	2
Villa's of Lakemeade No.2	Dry Creek	Portable Generator	Diesel	2	30			30	2
West Park	Whites Creek	Dual Feed		3	15,000	2	13,400	28,400	5
White's Creek	Whites Creek	Stationary Generator	Diesel	1	7,500	2	4,050	11,550	3
Williamson Ferry	Central	Portable Generator	Diesel	2	1,200			1,200	2
Windhaven Shores	Central	Stationary Generator	Propane	2	140			140	2
Woodlake	Central	Portable Generator	Diesel	2	300			300	2
Woodland Hills	Central	Portable Generator	Diesel	2	160			160	2
Woodland Pointe No. 1	Central	Portable Generator	Diesel	2	310			310	2
Woodland Pointe No. 2	Central	Portable Generator	Diesel	2	160			160	2
Woodside Drive	Central	Portable Generator	Diesel	2	210			210	2
Wyntergrace	Central	Portable Generator	Diesel	2	80			80	2
Grinder pumps (Maintained by MWS)		N/A		401	80				401
TITANS # 1 (Maintained by MWS)		Portable Generator	Diesel	3	3500				

## II. System Performance History:

Annual number of overflows	Originally (FY 1990)	FY2005
Sanitary Sewer Overflow Sites	164	55
Combined Sewer Overflow Sites	30	9
Number of Sanitary Sewer Overflows	512	Rainfall Induced - 263 Power Out - 12 Mechanical - 32 Maintenance - 76 <b>Total - 383</b>
Number of Combined Sewer Overflows	615	208



## Central WWTP Performance History

Per capita wastewater flow for the maximum month	5,050 gallons per capita per month (occurred in January 2006)
Per capita wastewater flow for the maximum day	362 gallons per capita per day (occurred in August 2006)
Average annual influent BOD (08/05-07/06)	166 mg/L
Average annual effluent BOD (08/05-07/06)	2.9 mg/L

Month (08/05-07/06)	Monthly Peak Daily Wet Weather Flow (MGD)	Monthly Average Daily Flow (MGD)	Ratio of Monthly Peak Daily Wet Weather Flow to Monthly Average Daily Flow
August 2005	239.2	82.1	2.9
September 2005	106.0	78.0	1.4
October 2005	76.9	70.4	1.1
November 2005	110.1	75.4	1.5
December 2005	148.5	62.6	2.4
January 2006	216.1	107.5	2.0
February 2006	143.0	97.1	1.5
March 2006	145.5	87.5	1.7
April 2006	162.7	69.4	2.3
May 2006	131.3	86.9	1.5
June 2006	101.2	72.7	1.4
July 2006	118.8	73.9	1.6

## Dry Creek WWTP Performance History

Per capita wastewater flow for the maximum month	1,045 gallons per capita per month (occurred in January 2006)
Per capita wastewater flow for the maximum day	78 gallons per capita per day (occurred in January 2006)
Average annual influent BOD (08/05-07/06)	153 mg/L
Average annual effluent BOD (08/05-07/06)	2.3 mg/L

Month (08/05-07/06)	Monthly Peak Daily Wet Weather Flow (MGD)	Monthly Average Daily Flow (MGD)	Ratio of Monthly Peak Daily Wet Weather Flow to Monthly Average Daily Flow
August 2005	46.8	14.7	3.2
September 2005	18.5	13.4	1.4
October 2005	12.9	12.0	1.1
November 2005	19.7	13.4	1.5
December 2005	30.2	14.9	2.0
January 2006	51.1	22.3	2.3
February 2006	27.7	18.9	1.5
March 2006	27.4	15.9	1.7
April 2006	31.9	16.6	1.9
May 2006	21.8	15.6	1.4
June 2006	15.6	13.0	1.2
July 2006	18.8	12.7	1.5

## Whites Creek WWTP Performance History

Per capita wastewater flow for the maximum month	1,692 gallons per capita per month (occurred in January 2006)
Per capita wastewater flow for the maximum day	95 gallons per capita per day (occurred in January 2006)
Average annual influent BOD (08/05-07/06)	87 mg/L
Average annual effluent BOD (08/05-07/06)	2.0 mg/L

Month (08/05-07/06)	Monthly Peak Daily Wet Weather Flow (MGD)	Monthly Average Daily Flow (MGD)	Ratio of Monthly Peak Daily Wet Weather Flow to Monthly Average Daily Flow
August 2005	54.7	18.0	3.0
September 2005	46.1	21.2	2.2
October 2005	22.2	13.3	1.7
November 2005	30.3	20.2	1.5
December 2005	42.0	25.5	1.6
January 2006	62.9	36.0	1.7
February 2006	48.2	35.6	1.4
March 2006	47.3	30.9	1.5
April 2006	46.3	32.1	1.4
May 2006	37.0	28.1	1.3
June 2006	28.7	20.4	1.4
July 2006	33.2	19.6	1.7

## **Section 3. SSO/CSO History and Summary of Rehabilitation Projects**

### **I. SSO/CSO History**

Figure 3-1 provides the annual volume of SSOs per 100 miles of separate sewer for 1990, 1995, 2000 and rolling 12-month annual volumes beginning in January 2005 through the present. Figure 3-2 provides the SSO events per 100 miles of separate sewer for 2006. The data provided is based on rolling 12-month annual events. Information presented by EPA Region 4 included a similar analysis for MOM participants. According to the EPA information, the average SSO events per 100 miles of SSS is 11 annually and the median is 8.5. As can be seen on Figure 3-2, MWS is below the EPA average for the past calendar year.

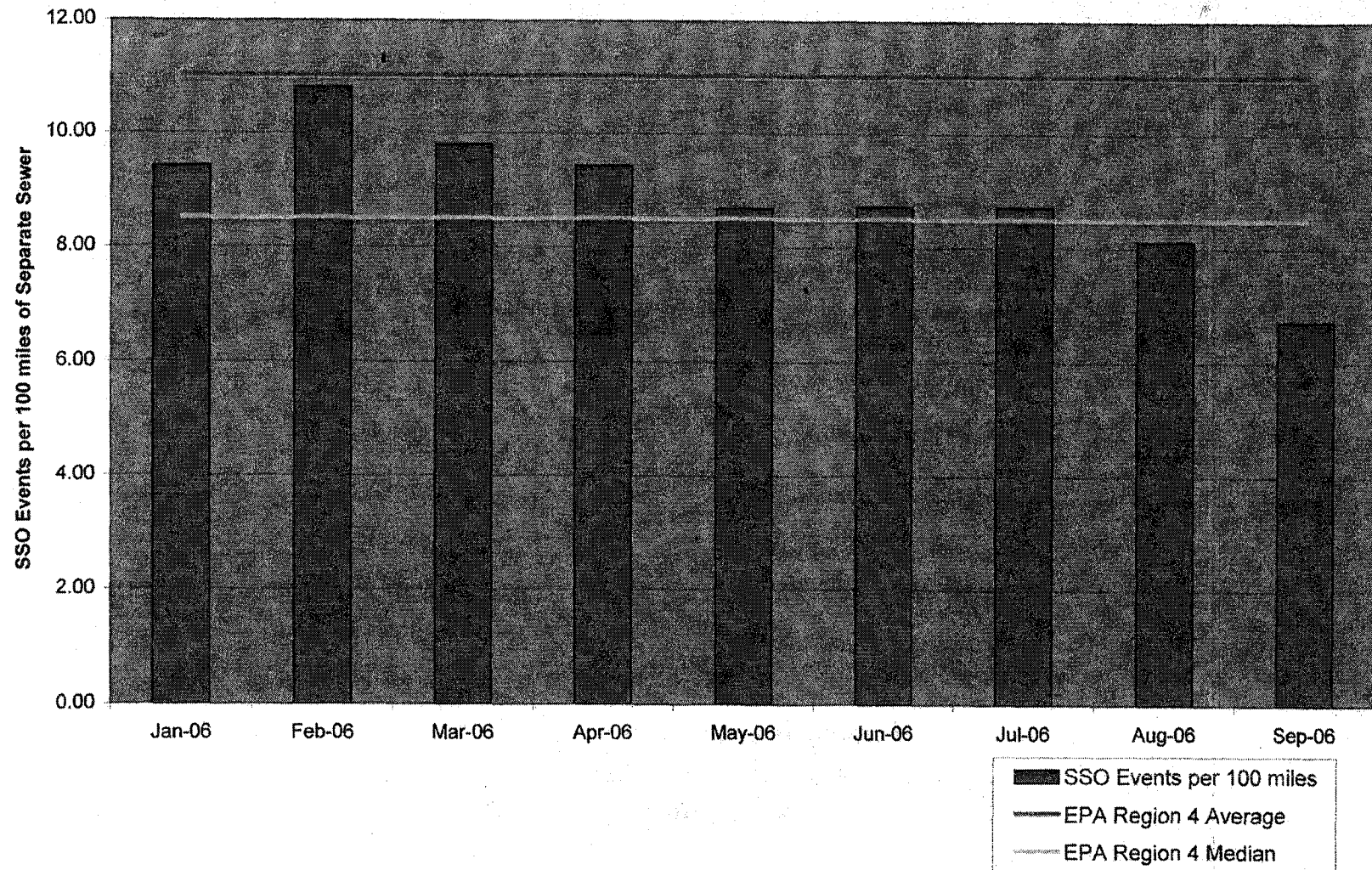
Appendix A provides more detail for the past five years of the overflow events of all available information regarding event durations, rainfall, overflow volume, type of overflow and overflow cause.

A 36-month summary of the CSO and SSO events is presented in Appendix A. These tables provide the event start and stop date, the amount of rainfall, the rainfall duration, the overflow volume, the overflow cause for each event, the location, and the receiving stream.

### **II. Rehabilitation Projects**

A summary of the rehabilitation projects completed to date, projects that are in design or under construction, and planned projects is provided on the OAP website ([www.nashville.gov.com](http://www.nashville.gov.com)) under the link on reports. A copy of the summary is provided digitally in Appendix B.

**Figure 3-1**  
**MWS SSO Events**  
**(Rolling 12-month Events)**



personnel are utilized for the benefit of other city functions or other utilities above what is required in the performance of work consistent with MWS's function.

The following is an overview of how other department's responsibilities assist in supporting MWS.

### **Human Resources**

In addition to the HR Division of MWS, the Metro HR Department provides many support and personnel functions on a Metro-wide level. The support functions include personnel policy development, administration, consulting, and guidance to the organization. The personnel functions include human resource administration, employee selection and placement, employee compensation and benefits, job classification, worker compensation administration, management and employee development, and employee relations.

### **Finance**

The Metro Finance Department provides additional support to the Accounting Division of MWS including

- procurement services for a variety of commodities and services necessary to insure prompt and efficient operations of MWS;
- guidance and assistance in the development and administration of the operating and capital budgets for MWS;
- Treasury Office of Finance manages the investment of MWS funds and handles fund disbursement;
- Surplus Property Division handles disposition of surplus MWS assets and remits the proceeds back to MWS.

### **Legal**

The Metro Legal Department provides legal services and advisory opinions to MWS on departmental issues and contracts and agreements, and is responsible for handling all claims against MWS. They represent MWS in Environmental Court when necessary for prosecuting violations of all water, sewer, and storm water ordinances.

### **Health**

The Metro Health Department oversees sewage disposal systems such as septic tanks that are not connected to the public sewer collection system. They are also responsible for enforcing connections to the sewer system when problems, such as failed septic systems, emerge and public sewer service is available. MWS coordinates with them to resolve problems that arise when septic tanks fail.

The Health Department also assists as needed with water quality issues with the public drinking water supply and distribution.

## **General Services**

Metro General Services provides support to MWS in three areas.

- Fleet Management is responsible for providing MWS with properly maintained vehicles and equipment to aid MWS in performing daily job duties.
- Real Property Services assists in building design, reconstruction, and major repairs by providing technical guidance and management support. They also recommend and procure office furniture and equipment.
- The Radio Shop maintains and operates an 800 MHz radio system for emergency communications. The system includes more than fifty radios strategically located to serve as a back-up system for internal and inter-agency communication should the primary systems fail.

## **Information Technology Service (ITS)**

ITS provides information technology and telephony, develops and implements recommended standards for information technology, develops and maintains security policies and systems, and coordinates the acquisition of information technology for MWS. ITS operates and maintains the network and hardware.

The Information Services Division of MWS, currently residing within the Customer Service Division, maintains software used specifically within MWS.

## **Planning**

The Metro Planning Department provides support, policy recommendations, and advice concerning the City's future growth and development.

## **Public Works**

MWS pays for pavement repair when excavation is necessary due to water, sewer, or storm water repairs or for system upgrades in a roadway. Occasionally MWS will participate with the Public Works Department on capital paving projects where Public Works covers the expense of paving restoration. MWS coordinates any utility relocation and/or upgrades with these types of projects when possible. The same relationship exists between MWS and the Tennessee Department of Transportation (TDOT) for similar projects. Casting adjustments to an existing infrastructure are also accomplished through Public Works and/or TDOT contracts and is reimbursed through financial transfer of funds.

## **City Clerk**

The City Clerk maintains copies of resolutions and ordinances passed by the City Council related to the operation of MWS. This office also maintains copies of any contract that is entered into by MWS on behalf of Metro.

## **II. Training**

### **a. Technical Training Program**

Training of the employees at MWS is overseen by the Training Section of the MWS HR Division. This section is responsible for ensuring that employees receive mandatory and professional development classes. Educational and development opportunities are provided through training services and counseling in three key areas: mandatory training and professional development, targeting (advancement), and educational reimbursement.

MWS employees are required to participate in a number of mandatory training classes by the Mayor's office, the Civil Service Commission, and the Federal Government. These mandatory courses are vital to an employee's development as a civil servant and are necessary for them to become familiar with established Federal, State, and local laws and department guidelines. Mandatory training classes often deal with issues consistent with the Federal Labor Standards Act (FLSA) such as workplace violence, sexual harassment, and safety related issues.

A request for a new employee to attend mandatory training is initiated by the section supervisor. This allows the supervisor to account for the employee's absence from assigned duties due to participation in the training class and potentially altered work assignments.

Mandatory training classes are held continually throughout the year on-site or at a location designated by Metro's HR Department. The mandatory classes are taught or overseen in-house by the Training Coordinator or the Safety Coordinator. When an employee is not able to take a training class taught by MWS, they have the option of attending a class taught by Metro's HR Department since the classes have the same content. At the conclusion of class, the roster is collected and entered into tracking software at both MWS's and Metro's HR Department. Metro's HR Department maintains the official employee training record. An example of an employee's training record is shown in Appendix D.

Employees are also able to take professional development classes to further develop existing skills or gain knowledge on new technologies and workplace innovations.

The flowchart in Figure 1 depicts the processes for enrollment in these classes.



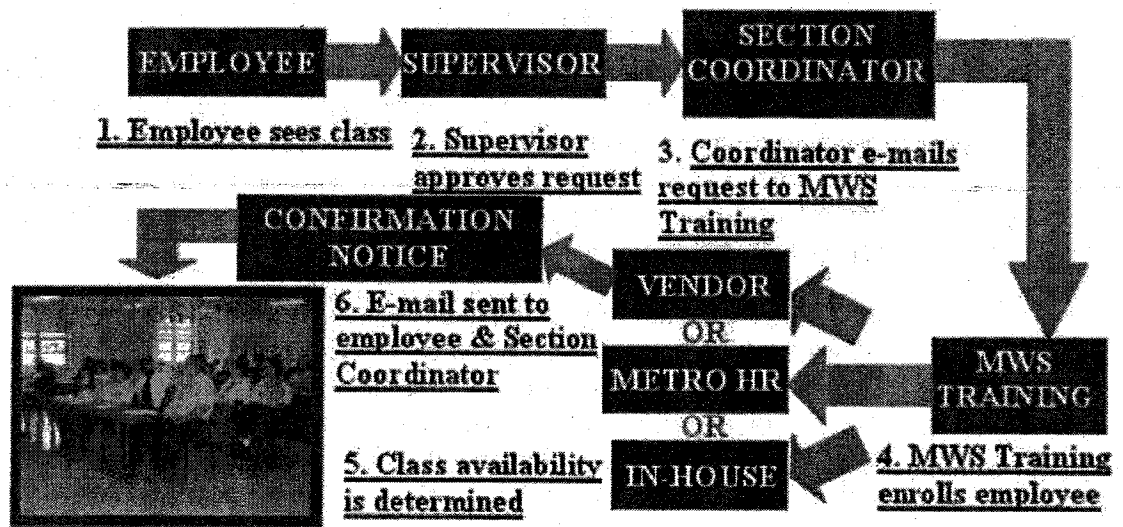


Figure 4-1. Enrollment Flowchart through Technical Training Program

Some employees of MWS are able to automatically target (advance) to the next level in their job classification once they have completed a specified training curriculum. The MWS Training Section oversees this targeting process and guides employees to the classes necessary for a job classification upgrade to occur.

MWS employees are given the opportunity to further their education through educational reimbursement. This is beneficial for employees interested in completing their high school education, as well as those seeking a college degree. Employees interested in taking advantage of this opportunity receive counseling from the MWS Training Section regarding program guidelines and requirements.

### b. Skills Training Program

Training on the use of specific equipment to be used and procedures to be followed to carry out job-specific duties are coordinated by the specific division or section within MWS. Typically this includes vendor training workshops, manufacturer training workshops, conferences, or on the job training. Some skill training courses also provide certified operators continuing education hours.

### Recommendation

MWS will conduct periodic testing, drills and demonstrations of competency training. This will be implemented by July 2008.

### **c. Safety Training Program**

All employees are required to participate in OSHA required training classes; however, not every employee will participate in all of the mandatory safety training. Safety training is dependent on the type of job an employee performs. Classes such as First Aid and CPR are provided to all employees, but other safety classes such as rigging and lifting or lock-out/tag-out are exclusive to employees that perform safety sensitive duties.

Many safety classes are video driven instead of instructor-led. Each division is responsible for conducting the necessary training specific to their work when an instructor is not required.

The Safety Coordinator, with assistance from the Training Coordinator, conducts instructor-led safety training for the divisions. The Safety Coordinator must ensure that annual safety training is conducted in each required division.

The Metro HR Department does not oversee the safety training that is conducted at MWS since that training is regulated by OSHA and other occupational safety organizations. Consequently, MWS is solely responsible for tracking these safety training records.

Table 1 lists the different safety training requirements, who must receive the training, and the frequency at which the training classes must be taken.

**Table 4-1. Safety Training Requirements**

<b>Safety Training Requirements</b>	<b>Who Receives</b>	<b>How Often</b>
Employee Emergency Plans and Fire Prevention Plans 29 CFR 1910.38	All Employees	Annual
Process Safety Management 29 CFR 1910.119	All Employees where relevant	Annual
Personal Protective Equipment 29 CFR 1910.132	All Employees where relevant	At Time Of Initial Employment
Respiratory Protection 29 CFR 1910.134	All Employees where relevant	Annual
Permit Confined Spaces Entry 29 CFR 1910.146	All Employees where relevant	Annual
Lockout/Tagout 29 CFR 1910.147	All Employees where relevant	Annual
Fire Protection 29 CFR 1910.155	Designated Employees	Annual
Portable Fire Extinguishers 29 CFR 1910.157	Designated Employees	Annual
Powered Industrial Trucks 29 CFR 1910.178	Designated Employees	Biannual
Bloodborne Pathogens. 29 CFR 1910.1030	All Employees where relevant	Annual
Hazard Communication CFR 1910.1200	All Employees where relevant	Annual
Laboratory Safety 29 CFR 1910.1450	Designated Employees	Annual

### **III. Safety Program**

It is the goal of MWS to conduct its operations in a safe and efficient manner with the utmost regard for the safety of both employees and the public. It is the policy of MWS to develop and administer a comprehensive safety program to eliminate and/or limit the exposure of MWS employees to hazards that may cause physical harm and loss of MWS property. Every effort is made by all levels of management to prevent injury and loss to employees.

The MWS Safety Program complies with the safety policies of OSHA of 1970 and the Tennessee Occupational Safety and Health Act (TOSHA) of 1972, and all Federal, State, and local safety codes and legislation. The Program also adheres to the requirements of the OSHA 200 Log and Summary of Occupational Injuries and Illnesses.

The key points of the MWS Safety Program are:

- Designating a Safety Coordinator to represent the Director and Assistant Directors in all matters of safety.
- Identifying and eliminating unnecessary hazards.
- Providing employees with the necessary training and, where required, specialized equipment so the necessary tasks to operate and maintain essential water and wastewater services can be safely performed when a recognized hazard cannot be eliminated.
- Minimizing the undesirable effects of an accident by providing rescue equipment and training.
- Establishing and maintaining records to identify, analyze, and evaluate health and safety problems.
- Requiring all MWS employees to follow all appropriate safety standards, rules, and regulations in the performance of their duties.

A safety checklist is utilized to document all site visits conducted by the Safety Officer.

#### **a. Safety Authority**

MWS has 14 individual safety committees throughout its department and a MWS Safety Council made up of safety chairpersons from each committee. Each committee and the council meets monthly.

The Safety Officer is responsible for implementing the MWS safety program and for coordinating and meeting with the safety committees and Safety Council.

## **b. General Safety Procedures Program**

The Safety Programs followed by MWS are listed below and are included in Appendix E.

### **Safety Office Policy Statement**

- S-1 American Red Cross First Aid, CPR and AED Program
- S-2 Americans with Disabilities Act Program
- S-3 At Fault Vehicle Accident Review Team (Safety)
- S-4 AWWA Safe Handling of Water Treatment Chemicals
- S-5 Bloodborne Pathogens Program
- S-6 Cave-In Protection During Excavation and Trenching Program
- S-7 Metro Water Services (MWS) CMOM Program
- S-8 Coaching the Backhoe Operator Program
- S-9 Commercial Drivers License (CDL) Program
- S-10 Confined Space Entry Program
- S-11 Defensive Driving Course Program(s) (6 and 4 hour)
- S-12 Emergency/Evacuation and Notification Plan
- S-13 FEMA's Domestic Preparedness Awareness Training Program
- S-14 Hazard Communication (Right-To-Know)
- S-15 Hazardous Waste Management Program
- S-16 Hearing Conservation Program
- S-17 Incident Command System (ICS) Training Program (Through Terrorism or Natural Disaster)
- S-18 Lead/Lead Paint Removal and Abatement Program
- S-19 One on One Coaching Program
- S-20 Recordkeeping Guidelines for Occupational Injuries and Illnesses
- S-21 Personal Protection Equipment (PPE) Program
- S-22 Powered Industrial Trucks and Forklift Training Program
- S-23 Process Safety Management (PSM)
- S-24 Protecting Your Safety and Health in the Plant Programs
- S-25 Radiological Health and State License Program
- S-26 Respiratory Protection Program
- S-27 EPA's Risk Management Program (RMP)
- S-28 Safe Operation of Heavy Equipment
- S-29 Safety Shoe Voucher Program
- S-30 Substance Abuse Policy

## **c. Traffic Management Procedures Program**

MWS follows all traffic management procedures as required by TOSHA and TDOT.

## **d. Lock-Out/Tag-Out Program**

MWS has a written lock-out/tag-out procedure included in Appendix E.

#### **e. Safety Equipment Program**

Appropriate safety equipment is provided for every MWS employee. Specific safety equipment programs listed in **Management Program, Section III.b. General Safety Procedures Programs** and included in Appendix E are:

- Personal Protection Equipment (PPE) Program
- Respiratory Protection Program
- Safety Shoe Voucher Program.

Additional equipment maintained by MWS includes harnesses, tripods, hoists, and fire extinguishers as required in other general safety programs.

#### **f. Safety Performance Program**

MWS records occupational injuries and illnesses (Safety Office Policy Statement S-20 Recordkeeping Guidelines for Occupational Injuries and Illnesses) according to OSHA's guidelines. The Safety Council (**Management Program, Section III.a. Safety Authority**) reviews records regularly and implements corrective actions as necessary.

Each Safety Office Policy Statement (**Management Program, Section III.b. General Safety Procedures Program and Appendix E**) includes performance measures and program evaluation.

### **IV. Information Management System (IMS)**

The Information Services (IS) Section within the Customer Services Division of MWS provides application support for the software applications used by MWS to track operations, system maintenance, and customer service. Computer server, network, and desktop PC support for MWS is provided by the Information Technology Services Department of Metro.

The applications supported are utilized by various divisions of the department in support of their day-to-day operations.

The following is a list of systems supported by MWS IS:

- Peoplesoft is used for time reporting, training records, leave reporting, and maintaining employee job history and information.
- HANSEN is used to support the Computer Maintenance Management System (CMMS), which is used to track work orders. An example work order is provided in Appendix F.
- Wonderware/System 6 is used for treatment plant process control.
- HSQ is used for SCADA systems for the wastewater system.

- Cityworks is used by the Stormwater Division to track service request and work orders. It is comparable to CMMS.
- HTE's Customer Information System is used for customer and location status, account history, utility billing, and accounting.
- LABWORKS ES LIMS is used to manage laboratory data.
- Engineering Project Tracking System is used to track the status of construction projects
- ESRI's Geographic Information System is used to store and display spatial information for water, wastewater, and stormwater systems.

The following list is of systems supported by Metro ITS.

- KIVA - Permitting system used by MWS as well as other departments.
- EBS - PeopleSoft financial system used by all departments of the government.
- Imaging - MWS has implemented document imaging systems for service locations, backflow inspection reports, Engineering files, and video inspection logs.

New Information Management Systems are continually being considered and tested. The FOG database SOFT has recently undergone beta testing (**Operation Program, Section IV. Fats, Oils, and Grease Control Program**), and an Asset Management Program is being developed. Customer Service and Systems Service are in the process of implementing a mobile dispatching system to improve response time to system problems and customer request for service.

### **Recommendation**

MWS will develop and implement a process for reviewing all inspection, maintenance, operation and customer complaint records to identify reoccurring problems. This process will include a corrective action plan to address reoccurring problems that develop. This process will be ready for implementation in January 2008.

## **V. Engineering**

### **a. Collection and Transmission System Plans Program**

MWS requires as-built drawings in both hard copy and digital formats for all new construction in the collection system. Plan submittal requirements are included in the Guide to New Construction, accessible at the website:

[http://www.nashville.gov/water/permits\\_handbooks.htm](http://www.nashville.gov/water/permits_handbooks.htm).

Acceptance of a new facility and final payment to the contractor is contingent on receipt of all required documents. The inspection staff maintains a file of all

documents pertaining to the project until a complete set of required documents is received. Once the file is complete with all final documents, the as-builts are sent to the GIS/Records Unit to be entered into the GIS.

## **b. System Inventory and Mapping Program**

Several years ago, MWS recognized the need to accurately maintain detailed records for the sewer collection system. Prior to implementation of the current Geographic Information System (GIS), historical information was stored on paper maps and in multiple notebooks maintained by the GIS/Records Unit. MWS invested in a multi-million dollar project to create a digital format that could be easily accessible to office and field personnel. The current GIS utilizes ArcView® software manufactured by ESRI.

To convert the information to the GIS environment, all existing paper plats were imported into the GIS along with select as-built attributes including invert elevations, rim elevations, pipe diameter, line segment lengths, pump station location, and force main information.

The MWS sanitary sewer system records are managed by the GIS/Records Unit of the Design and Development Review Section. The GIS/Records Unit of the Engineering Division is responsible for maintaining and updating maps of all existing sewer infrastructure. The goal of the GIS/Records Unit is to provide the department with the latest detailed collection system information for performing daily operation and maintenance on the collection system. Current information is also used to guide future development within the MWS service area.

All projects received by the GIS/Records Unit from the inspections staff are entered into the system. A log is maintained of the project as-builts that are received and that are mapped. The Supervisor of this unit checks the log to verify the progress on projects.

The GIS is accessible to all employees of MWS. MWS uses the GIS to investigate customer complaints, locate utilities, and generate work orders related to maintenance, repairs, relocations, and extensions of the collection system.

In early 2006, MWS contracted with an engineering consultant to convert a large backlog of projects into GIS. A backlog of projects is not a common occurrence. The backlog was a result of the need to enter past projects into the system. MWS has the resources to enter current and future projects. Previously, MWS's staff was involved in QA/QC during the data conversion of past projects.

The GIS/Records Unit updates the sanitary sewer maps as they receive the converted files. Continual quality assurance/quality control evaluations on the sewer atlas to ensure accuracy and user confidence is conducted by the GIS/Records Unit. Field personnel from all divisions of MWS assist by noting data discrepancies and submitting to the GIS/Records Unit for correction.



The GIS with the computerized maintenance management system (CMMS), which is used by the System Services Division and Operation Division of MWS to track work requests and maintain historical data on repairs to the system, is maintained and updated.

In addition to sanitary sewer collection system data, the GIS also contains additional information pertaining to the City of Nashville which is maintained by the Metropolitan Planning Department. This information can be displayed when necessary. The data available includes other utilities, water topography, map and parcels, zoning, land use, wetlands, and floodplain data.

### **c. Sewer System Design Program**

The Design and Development Review Section of MWS manages the design of all collection system capital projects of the department and reviews collection system design plans for extensions of the sewer serving new development. Construction documents are prepared by both in-house staff and outside consultants.

Standard technical specification and construction details are included in the Guide to New Construction. This document is located on the following website:  
[http://www.nashville.gov/water/permits\\_handbooks.htm](http://www.nashville.gov/water/permits_handbooks.htm).

As-built drawings are required in the Guide in both hard copy and digital form upon the completion of a sanitary sewer project. This requirement is part of the "lay and deed" process (see **Management Program, Section V.d. New Construction and Rehabilitation Inspection Program**) and must be completed before final acceptance of the project.

Technical requirements that apply to all aspects of collection system construction are included in the Guide. The following are types of projects addressed.

- New Gravity Line Construction
- New Pump Station and Force Main Construction
- Existing Gravity Sewer Relocations
- Pump Station Upgrades
- Force Main Relocations

The Guide to New Construction is reviewed and updated periodically to reflect changes in TDEC requirements, MWS preferences, and feedback from MWS inspectors, MWS engineers, and consulting firms that are using the Guide on a daily basis. The most recent update to the Guide was completed in March 2004.

The Guide incorporates the TDEC Division of Water Pollution Control *Design Criteria for Sewage Works* as the standard document for designing all sanitary sewer collection

systems. The TDEC document is supplemented by the *Recommended Standards for Wastewater Facilities*. MWS has delegated authority from TDEC which allows MWS to approve plans without submitting the plans to TDEC.

The purpose of the Guide is to ensure that all new sanitary sewer system construction is adequately designed and constructed using specifications that ensure the integrity of the new infrastructure. For design issues not addressed in the guide, design engineers are required to provide technically supported design procedures that must be approved by MWS.

#### **d. New Construction and Rehabilitation Inspection Program**

The Construction Inspection Section is responsible for the construction administration and inspection of all new sanitary sewer lines and public water mains extensions in Davidson County and of connections to the MWS system from the five adjoining counties. Within this section, there are six independent units whose role is to assist and support each other and internal and external customers. The units are Casting Adjustments, Patch Paving, Overflow Abatement Program, Lay and Deed Projects, Contract Projects, and Deeds and Bonds. The Casting Adjustments Unit and Patch Paving Units are discussed in **Maintenance Program, Section IV.c. Street Paving Monitoring Program**.

All inspectors are required to ensure the project meets the MWS specifications while under construction. The inspector completes daily reports documenting construction activities for each day he is on-site. These reports are maintained as a part of the project file.

MWS augments the inspection staff with inspectors from engineering consultants when necessary. These consulting inspectors are responsible for all aspects of the project required for MWS inspector.

Depending on the nature of the project, the inspector is responsible for:

- Pre- and post-televising of sewer lines that are rehabilitated
- Confirming air tests on sewer lines
- Confirming vacuum tests on manholes
- Taking samples of liners to the lab
- Ensuring that yards and driveways are restored in a timely manner
- Maintaining an up-to-date record of construction activities
- Reviewing all pay requests before payment is made to the contractor
- Ensuring plans and specifications are followed

- Ensuring a set of red-line and as-built drawings are maintained by the contractor
- Answering and following-up on complaints from the property owners
- Overseeing any testing related to water distribution systems
- Documenting run-to-curb measurements
- Coordinating with contractors to ensure the impact of project activities on the general public is minimized
- Ensuring projects are installed in the most cost-effective manner
- Ensuring all required changes have the appropriate documents prepared per the "Regulations to the 1992 Procurement Code- Revised 17 June 2004"
- Ensuring all contract requirements are met (i.e. insurance, bonds, releases, etc.)

#### **Overflow Abatement Program**

When a contractor is awarded an OAP project, an inspector is assigned to that project. If MWS does not have available staff to inspect the project, an inspector from an engineering consulting firm will be utilized, often from the design engineering firm.

#### **Lay and Deed Projects**

The Lay and Deed Unit has the responsibility of overseeing new water mains and new sewer lines built by a private utility contractor hired by a private developer or engineer. MWS assigns an inspector to each project because these projects will become a part of MWS's infrastructure upon completion of the project.

After completion, the construction project and the utilities are deeded to MWS to become part of the MWS's Infrastructure Assets.

#### **Contract Projects**

MWS also provides inspection services for contract projects. Bi-weekly meetings are held with the project team on each project. On large scale projects, the public is invited to attend to provide input on behalf of the community.

#### **Deeds and Bonds**

The Deeds and Bonds Unit prepares all the paperwork dealing with the legal transfer of privately-built mains between a developer and MWS and sets and tracks the performance bond amounts. The Deeds and Bonds Unit is the bond holder in all cases except where Planning Commission approval is required.

MWS assigns an inspector to each of these projects because these projects will become a part of MWS's infrastructure upon completion of the project. After the project is complete, this unit prepares a deed of conveyance to transfer the property from the developer to MWS.

## **Recommendation**

MWS will develop standard operating procedures for conducting construction inspections that include methods for documenting inspections and maintaining the documentation. Training requirements for all inspectors will be included. Other means for managing data to closeout projects will be evaluated. The SOPs will be ready for implementation by January 2008.

## **e. Acquisition Considerations Program**

### **New Construction (Private Developments)**

New private sewer lines that connect to the MWS system are inspected during construction. In Davidson County, the codes enforcement department performs the inspection.

### **Existing Sewer**

MWS does not have a written policy on acquiring existing sewerage service areas. In the past, Metro has been approached and has accepted the ownership, operation, and maintenance responsibilities of several smaller sewer systems. Any sewers incorporated into MWS' system are required to comply with MWS' standards or have a plan to bring the sewer system to standards before it was accepted. The plans are finalized detailing needed system maintenance once the sewer systems were transferred to MWS.

The Engineering Division and independent consultant assisted with evaluation and recommendations on acquisition of these systems. The Administration Division is responsible for all other aspects of the transfer of these systems to MWS.

## **Recommendation**

MWS will develop and implement a standard policy for acquisition of existing sewer systems. This policy will include a plan for bringing sewer systems up to MWS's requirements and standards if the existing system doesn't meet them and the criteria that will be used for the determination of the financial aspects of the acquisition. This policy will be completed by January 2008.

## **Easements**

Property rights are necessary for the installation, operation, and maintenance of both water and wastewater facilities. Property rights are obtained for specific projects under the authority granted to Metro by the State of Tennessee.

As work progresses during the planning and design on a specific project, a request for approval to acquire property rights for that project is submitted to the Metropolitan Planning Commission (MPC). The MPC reviews the project for compliance with the Capital Improvement Budget (CIB) and acts to approve or disapprove the project moving forward.

With the approval of the MPC, an ordinance is submitted to the Metropolitan Council for the acquisition of property rights for the planned project. This document identifies the specific parcel(s) of land from which property rights will be sought. Upon passage of three readings by the Metropolitan Council, approval by the Mayor, and certification by the Metropolitan Clerk, MWS may pursue acquisition of the necessary property rights.

Engineering drawings and descriptions of the property rights to be acquired are prepared and an independent public appraiser makes a determination of value for the rights to be acquired. The property owner is contacted by MWS staff and negotiations to obtain the property rights are pursued. If a negotiated settlement with the property owner cannot be reached, and a reasonable alternative to avoid the need for the property rights cannot be identified, MWS will turn the acquisition process over to the Department of Law. That Department will seek acquisition by either negotiation or condemnation in order to provide the required property rights for the project.

Once the property rights have been acquired, the documentation of those rights is filed with the Registrar's Office of Davidson County to ensure the rights become a permanent record with the property deed. Property rights obtained for projects located in the MWS's service area which are outside of Davidson County are made permanent record in the Registrar's office for the county in which the land is located. Recording property rights documents is crucial to the long term protection of MWS facilities.

MWS maintains files on the active projects for which property rights acquisition activities are underway and reports the status of the activities on an as-needed basis. In addition, MWS's Engineering Tracking System is updated to reflect property rights acquisitions as they are completed. These records include the instrument number for the documents as they are recorded in the Registrar's Office to facilitate future reviews of information.

## **f. Continuous Sewer System Assessment Program**

MWS does not use the term "Continuous Sewer System Assessment Program" (CSSAP). However, MWS conducts many activities that meet the intent of a CSSAP.

### **i. Prioritization**

The prioritization matrix is discussed below in Section V. g., **Infrastructure Rehabilitation Program (Overflow Abatement Program (OAP))**.

### **ii. Dyed Water Flooding**

Dyed water flooding is used on a limited basis in situations where there is a significant amount of I/I but site conditions necessitate the use of a point repair rather than relining or replacement, such as removal of a direct storm sewer connection. These instances are very rare; however, all sewer crews carry dye tablets and use the tablets as needed to confirm flow sources.

### **iii. Corrosion Defect Identification**

Corrosion defect identification is an integral part of MWS's OAP. Corrosion defect identification is accomplished by routine pump station inspection and manhole inspections. Chemical corrosion control is used at 19 pump stations located throughout the system. See **Operation Program, Section III. Corrosion Control Program** for more details on the program.

### **iv. Manhole Inspection**

Manhole conditions are assessed by cleaning crews, the manhole rehabilitation crew, or a contract crew. As routine cleaning is performed, the cleaning crews observe and note any manhole deficiencies on their cleaning or TV logs. When a basin is targeted for rehabilitation, the manhole crew or the contract crew inspects each manhole in the basin. The resulting information is used to develop work orders for the manhole crew to correct, to assign to a contract manhole rehabilitation crew, or to include in a rehabilitation project. (See **Maintenance Program, Section II.c. Manhole Preventative Maintenance Program** for more detail.)

In addition, \$250,000 is designated in the annual capital budget to conduct additional manhole inspections outside of those completed during rehabilitation projects.

An example manhole inspection form is in Appendix G.

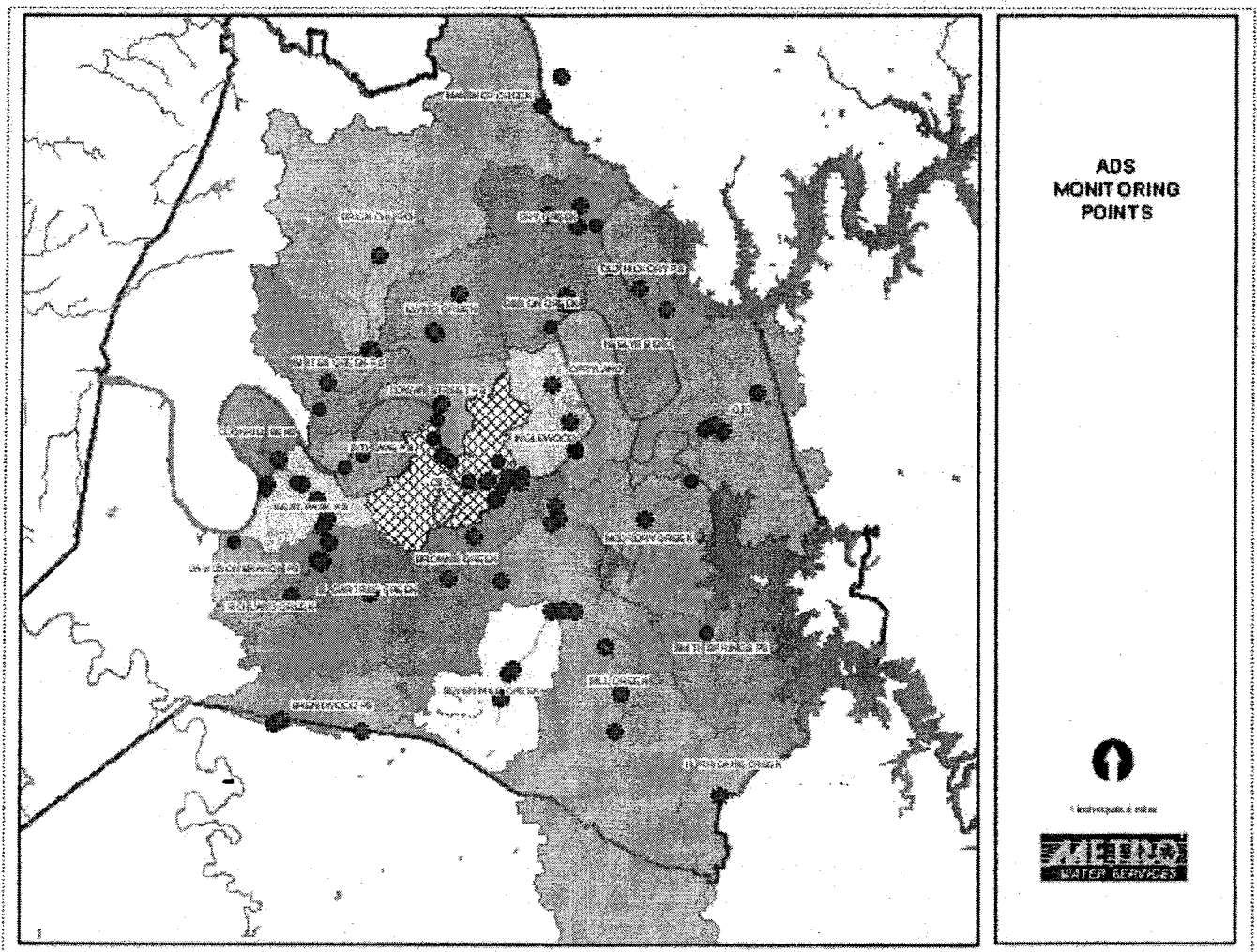
### **v. Flow Monitoring**

MWS has 61 permanent flow monitors installed in sewer lines ranging in size from eight inches to 84 inches in diameter. These flow monitors are installed at the outlet of the intermediate drainage units (IDU) in the collection system. The data from these flow monitors are used for model calibration, flow trending, and to direct the efforts of the OAP. The effectiveness of the OAP rehabilitation efforts is determined utilizing flow data from the permanent network of flow monitors as well as additional temporary flow monitors that are installed as needed. For each basin identified for rehabilitation, the basin is divided into smaller units and temporary flow monitors installed for more intense study. Typically, after rehabilitation efforts are complete, the temporary monitors are reinstalled during wet weather events to monitor the effectiveness of the project and to determine if any additional work is needed.

In addition to the permanent flow monitor locations, MWS also has 22 flow monitors installed in overflow lines from bleeders and sewer pumping stations. (A bleeder is a pipe added to an existing manhole to convey overflows from the manhole to a designated location. The main purposes are to allow overflows to be monitored and to prevent property damage and public health concerns from overflows occurring in streets or into a home.) There are 19 tipping bucket rain gauges installed across the service area. These flow monitors and rain gauges are used for monthly reporting to TDEC to comply with MWS's NPDES permits.

Operation and maintenance and data analysis for the flow monitoring network is performed by a national consulting firm. The contract stipulates that each monitor

When the contractor observes grease or debris in the sewer, System Services Division personnel are contacted to investigate and clean the sewer lines. If any significant change in flow is noted when evaluating the flow data, the System Services Division is also notified to investigate and corrective action is identified. Figure 2 shows the flow monitoring locations.



### Figure 4-2. Flow Monitoring Locations

Daily closed circuit television (CCTV) and cleaning are performed by MWS's System Services TV and cleaning crews (See **Maintenance Program, Section V.c. Gravity Line Preventative Maintenance**). The TV and cleaning crews plan their work, but also adjust priorities to respond to customer complaints, sewer blockages, sewer

overflows, requests to locate new services, etc. Other factors involved in scheduling the work are:

- Meeting the goal to inspect and clean all sewer lines within the next 3-5 years
- Need for documentation of sewer system condition downstream from industrial customers who may discharge materials that could harm the sewers
- Inspection and cleaning of grease generators
- Assistance with televising lines during wet-weather events to identify I/I for the OAP
- Inspection of sewers to define areas for rehabilitation. TV information is used by engineering consultants or System Services to develop bid packages with line segments and manholes to be rehabilitated.

During cleaning or CCTV work, if a problem is observed that requires correction, the crew leader prepares a work request to correct the problem or report to the OAP. Daily work is entered in the CMMS. The Sewer Maintenance Supervisor also maintains daily records of the footage of sewers cleaned and televised and accumulates the monthly totals. The monthly totals are used to monitor progress versus the goals and objectives for the CCTV and cleaning work.

### **Recommendation**

MWS will develop and implement standard line condition codes (1 to 5) for use when televising sewer lines. These codes will be manually recorded on TV Inspection Reports. Implementation of this recommendation will be completed by November 2006.

MWS will implement modified data entry into CMMS to allow entry of the standard sewer line condition codes from the TV Inspection Reports by January 2007.

MWS will evaluate the software to enter standard defect codes from guidelines in to CMMS by April 2007.

### **vii. Gravity System Defect Analysis**

Gravity system defect analysis is an integral part of MWS's OAP, as discussed in **Section V.g Infrastructure Rehabilitation Program (Overflow Abatement Program, OAP)**. The purpose of the gravity system defect analysis program is to establish consistent standard procedures and guidelines for defect identification. Under the direction of the recently implemented Asset Management Program, MWS is in the process of implementing criteria to observe and document the condition of a sewer line on a scale of one to five and provide consistent guidelines for defect identification. This allows different crews and/or subcontractors to use the same



standard terminology for categorizing defects, which allows the reviewer to better prioritize defects in respect to future rehabilitation.

#### **viii. Smoke Testing**

The purpose of smoke testing is to identify sources of direct surface water runoff into the sanitary sewer collection system during periods of wet weather. Smoke testing is generally performed during dry weather and conducted as a supplement to CCTV inspection as needed.

#### **ix. Service Lateral Investigations**

Service laterals are the responsibility of the property owner from the dwelling to MWS's main sewer line. Service lines are televised on a case-by-case basis when a licensed plumber has determined that there is a problem under a street or sidewalk. MWS will televise the service line inside the right-of-way or easement to confirm the presence of the problem and its location, and make repairs as necessary. Proposed legislation is in process to further clarify ownership of service lines and enable MWS to perform necessary repairs inside rights-of-ways or easements.

#### **x. Pump Station Performance and Adequacy**

The purpose of the pump station performance plan is to ensure that the pump stations are performing as designed. MWS follows the State's requirement that pumping design capacities must be met in the event that the largest pump at a given station is not operational.

All of MWS's 101 pump stations are continually monitored in the central control room at MWS's Omohundro WTP. Records of each pump station's performance are maintained in order to determine if a pump station is in need of repair or upgrade.

A copy of a pump station's inspection form is located in Appendix G.

### **Recommendation**

MWS will develop and implement standard operating procedures for all assessment practices including technical procedures for carrying out each practice and a means to ensure follow-up is completed on information that is documented during any assessment practice. All current forms will be reviewed to determine if the appropriate information is being obtained and new forms will be developed as necessary. A written standard method of prioritization of all assessment practices will be included. This work will be completed by October 2007.

#### **g. Infrastructure Rehabilitation Program (Overflow Abatement Program, OAP)**

Representatives from Region 4 EPA made site visits to MWS in December 2005 and June 2006. Both site visits consisted of formal presentations by MWS staff on specific topics, followed by tours of both CSS and SSS facilities.

On December 5 & 6, 2005, a presentation was made at TDEC's offices to both EPA and TDEC staff members. The presentation included an update on the status of MWS's OAP, the Wastewater Capacity Management Plan, the Master Wastewater Growth Plan, Flow Monitoring, Modeling, and SCADA capabilities, the Fats, Oils, and Grease Program, operation of the three wastewater treatment plants, and the Watershed Management Plan for Water Quality in local streams and rivers. A tour of some of the CSS facilities and other active SSS construction project sites was conducted for the attendees.

In January 2006, MWS received an information request from EPA under Section 308 of the Clean Water Act. The requested information was assembled and delivered to EPA as required on February 3, 2006.

On June 28 & 29, 2006, presentations were given at MWS's offices to EPA representatives on the Nine Minimum Controls efforts for CSO discharges, the Long Term Control Plan for the Combined Sewer System, and the status of the OAP. Tours were conducted of a number of SSS facilities and projects, including the recently completed equalization basin at the Smith Springs pump station and the new equalization basin under construction at the Dodson Chapel pump station. The attendees also toured each of the CSO points in the MWS CSO.

### History

Two reports were prepared addressing the SSS and CSS. The *Wastewater Facilities Plan* for the expansion of the SSS tributary to the three wastewater plants was prepared in 1987; in 1988, the *Combined Sewer Overflow Study for the Cumberland River and Browns Creek* was published addressing the problems of the CSS. This report considered sewer separation, offline storage in detention basins and inline storage in conveyance tunnels as possible options for resolving CSOs. In 1988, TDEC requested an addendum to the 1988 report. The addendum was submitted in 1990 with the directive from TDEC that the OAP either eliminate the bypasses to Browns Creek or reduce the overflow frequency to an average of once every 14 months. TDEC also requested that the priority ranking mechanism consider not only the least cost per million gallons stored but also include a consideration of the type of wastewater likely to enter the CSS. Basins with hospitals or industrial wastewater were to be given a higher priority than those with predominately commercial/residential wastewater sources.

MWS and TDEC conducted ongoing discussions before and after the publishing of the reports to assure that the plans being developed addressed TDEC's concerns and to ensure that TDEC was aware of the costs of the improvements to the sewer system.

On March 31, 1990, MWS received a Commissioner's Order from the State of Tennessee Department of Health and Environment (now TDEC) that directed MWS to eliminate CSOs to Richland Creek by July 1, 1991, to Browns Creek by July 1, 1996 and to eliminate all unpermitted bypasses and overflows from both the combined and separate sewers to the Cumberland River by July 1, 2001. Bypasses at 31 of 38 sites

were to be eliminated by December 31, 1992; the remaining seven sites were to be eliminated by December 1, 1993. MWS was directed to eliminate bypassing at a total of 45 locations including two treatment plants, 27 pumping stations and 16 regulators.

MWS moved forward with an ambitious and costly plan to rehabilitate the wastewater collection system under the Overflow Abatement Program (OAP). The program's goals included the elimination of overflows of wastewater from the separated sewer system (SSS) attributed to rainfall events and the application of best management practices to the combined sewer system (CSS) to minimize public health impacts caused by rainfall induced overflows.

MWS embarked on an aggressive program in 1990 to address the Order and resolve environmental issues associated with CSO and SSO discharges. The first few years were project oriented to comply with the supplement project milestone listing of the Order. All 3 WWTP's, 6 major pumping stations, 2 major trunk sewer parallels and numerous other pump stations and line work in the system were upgraded. Some SSS rehabilitation was begun in the early OAP years. A comprehensive water quality and modeling effort was begun to assess the impact of discharges to the Cumberland River. After data collection and modeling a shift in the CSS from a storage/equalization approach to demonstrative CSO control was proposed. The CSO impact on the Cumberland River with proposed improvements was determined to be short term and near field. TDEC accepted this approach, and the OAP shifted effort to address SSO's more aggressively.

MWS received an additional Commissioner's Order on September 17, 1999. This Order addressed continued overflows occurring during both wet and dry weather. Following discussions between MWS and TDEC, supplemental TDEC correspondence extended the compliance schedule for MWS to December 31, 2007 to reflect the magnitude of the requirements for the environmental issues faced.

It has become apparent that the 2007 deadline will not be met. MWS recognizes the importance of this issue and is currently developing a plan that will be implemented by the 2007 deadline. MWS is committed to resolving the SSOs and CSOs in a manner that is mutually agreed to by TDEC and MWS.

#### **Execution of the OAP**

The concentrated efforts of the 16-year OAP are addressing design, construction, maintenance, and improper building connections of the past 85 years. Projects have been conceptualized, planned, designed, and constructed to remove sources of I/I resulting in overflows. In addition, projects have been performed to increase capacities of sewer lines to transmit higher wastewater flows to and improve/optimize treatment capacities at the three WWTPs. Other projects have improved the mechanical and electrical reliability of sewer pumping stations and provided peak flow equalization for wet weather events in both the CSS and SSS. Separation of smaller basins in the CSS smaller basins, where economically feasible

and practical, has also been performed or proposed in order to eliminate a CSO discharge instead of screening the discharged flows.

As overflow locations have been identified, an overflow point number is assigned for tracking purposes. An initial assessment is performed to identify any obvious defects or potential "quick fixes" that could mitigate overflows in that location. After internal implementation of these short term items, monitoring of the point continues. If the issue persists, then projects are formulated to address the overflows focusing generally on SSO's and a long-term approach of I/I removal. The projects are conceptualized and entered into the OAP project listings for funding and implementation.

A priority matrix for prioritization was developed to rank the projects for study, project planning, design, and construction for implementation of abatement action and overflow point resolution. This was necessary in order to direct funding to the most immediate need, and to recognize the reality of budget constraints and the availability of resources. This process is administered by a diverse MWS committee and presented to MWS senior management for incorporation into the overall MWS capital budgeting process.

The matrix includes the following factors:

1. CSS or SSS -        5 points for SSS overflows  
                             2 points for CSS overflows
2. Overflow type -    5 points for overtopping manholes  
                             3 points for pumping station or constructed bleeders  
                             1 point for overflows directly to the Cumberland River
3. Design storm -    5 points for a 5 year return frequency  
                             2 points for a 2 year return frequency in the SSS
4. Multiple overflows - If a project will impact more than one overflow point an additional point is assigned to the project
5. Maintenance issues -    3 points for high frequency return requirements  
                                     2 points for lower frequency return requirements  
                                     0 points for no documented maintenance issues
6. Regulatory/basin issues - 1 to 5 points are assigned based on degree of sensitivity of the receiving creek/stream or river -  
   5 points to Richland, Gibson, and Percy Priest  
   4 points to Browns, Dry, and Stoners  
   3 points to Mill and Whites  
   2 points to other streams  
   1 point to Cumberland River

7. Payback/cost effectiveness -
  - 5 points for 0-5 years
  - 4 points for 6-10 years
  - 3 points for 10-15 years
  - 2 points for 16-20 years
  - 0 points for greater than 20 years
8. Data collection status - Up to 3 points assigned based on available smoke testing, flow monitoring, and TV inspection data
9. Overflow frequency based on 2002 - 2003 event count -
  - 5 points assigned for 50+ events
  - 4 points for 26 - 50 events
  - 3 points for 11 - 25 events
  - 2 points for 6 - 10 events
  - 1 point for 1 - 5 events
10. Overflow duration based on 2002 - 2003 data -
  - 5 points for greater than 500 hours
  - 4 points for 101 - 500 hours
  - 3 points for 51 - 100 hours
  - 2 points for 11 - 50 hours
  - 1 point for 1 - 10 hours
11. Overflow volume based on 2002 - 2003 data -
  - 5 points for 500+ MG
  - 4 points for 101 - 500 MG
  - 3 points for 26 - 100 MG
  - 2 points for 11 - 25 MG
  - 1 point for 1 - 10 MG
12. Peaking factor -
  - 5 points for 12.1:1 or higher peak ratio
  - 4 points for 10.1-12:1
  - 3 points for 8.1 to 10:1
  - 2 points for 5.1 to 8:1
  - 1 point for up to 5:1
  - 2 points for CSSs

The matrix is updated periodically to reflect changes in the scores as a result of system improvements and the most current data. Once the prioritization has been performed or updated, the project list is organized by point value, with the higher point totals being assigned greater priority. This is the basis for the annual capital program projections for the OAP and resultant projects to be undertaken.

Other factors may impact the prioritization of projects beyond the priority matrix scores. These factors include integration into other department, government agency, or developer-based project schedules and availability of funds from the MWS's

Capital Improvement Budget and other funding sources. Current projects or related projects also impact the final project selection as with multiyear efforts for scheduling.

As each overflow point is studied, flow monitoring data and CCTV inspection data is gathered. This information is utilized to accurately focus rehabilitation and/or replacement efforts to those areas where defects allowing I/I are known to exist. This results in a conservation of project funds and improves effectiveness of the individual project. Intermediate segment rehabilitation between identified defect segments is incorporated based on engineering judgment of potential for the migration of I/I. Standard protocols include the rehabilitation of all manholes, service connection points, and service laterals to the right of way/easement line as a part of all rehabilitation projects.

Upon completion of each project, assessment of the effectiveness of the project is performed by post-project flow monitoring and/or observation of the frequency, duration, and volume of subsequent overflow events. Based on this assessment, the need for additional work to address the overflow point is determined and supplemental projects formulated.

Overflow points which are no longer active are placed on a watch list to further verify elimination of the overflow before the overflow is considered eliminated.

A summary of the progress that has been made by MWS in resolving the CSO/SSO problems in the sewer system is located in **Section 7. Combined Sewer Overflow Program**. The MWS website [www.nashville.gov/water](http://www.nashville.gov/water) , provides a detailed list of CSO/SSO projects that have been completed, are under design, in construction or are planned for an abatement action.

A monthly report of OAP activities is prepared and issued to TDEC. In addition, a presentation of the program activities and planned projects is given to TDEC annually. All overflow events, regardless of cause, are reported to TDEC monthly in accordance with NPDES permits and the DMR reporting system.

### **Cost of the OAP**

Approximately \$799 million has been committed to the OAP to date. A total of over \$179 million in projects are either underway or planned for the future. There are \$28 million of projects in design or advertised. Of that total, \$26.3 million addresses SSOs; \$1.4 million addresses CSOs. Over \$24 million is earmarked for projects that are in the planning stage; \$734,000 is to address WWTP improvements, \$12 million is to address SSOs and \$12 million for CSOs. Future projects totaling over \$112 million have been identified. Of that total, over \$68 million addresses SSOs and over \$43 million, CSOs.

## **Recommendation**

MWS will develop and implement a Wet Weather Management Plan to address wet weather conditions once the sewer model conversion is completed. The plan will be completed by December 2008.

## **h. System Capacity Assurance Program**

### **Wastewater Capacity Management Plan**

The Wastewater Capacity Management Plan (WCMP) (Appendix H) was developed in August 1990 to comply with the Commissioner's Order issued March 30, 1990. This is a comprehensive plan describing all the essential elements to effectively execute the OAP and addresses how to allocate sewer capacity to accommodate growth and not allow future conditions to develop which could cause bypass or overflow of the system. Specifically, it provided the basis for lifting the hook-up restrictions imposed by the Order.

All proposed developments within MWS's service areas require a determination of the availability of sewer and/or water services. Developers and property owners or their representatives submit a request form to the Development Services Section of the Engineering Division.

The following information must be included with the request:

- Location of the property with tax map and parcel number
- Total acreage of the site
- Intended type of development or use of the property, including total square footage of proposed building
- Projected wastewater flow in gallons per day
- Subdivision development plan with finished floor elevations

Details of the request procedures for the residential and commercial permits can be found in the handbooks on the website: <http://www.nashville.org/water>.

As required by the WCMP, MWS can allocate 70% of the sewer lines for peak dry weather flow before capacity improvements must be made. At 70% the basin is evaluated and improvements are planned. By the time peak dry weather flow reaches 85%, the identified capacity improvement must be operational. Small improvements are constructed by the developer and deeded back to MWS. If the improvement is to a major trunk or facility, the improvement is funded by MWS utilizing capacity fees.

When a request for sewer availability is received by MWS, the sewer model is run from the point of connection into the closest 10" diameter or greater sewer line to the wastewater treatment plant using the increased peak flow from the requested

connection point. If no bypassing is predicted in the model, the request is approved and the model database adjusted to reflect the new capacity.

Flow monitoring is essential to ensure that the information generated by the model is accurate. The network of flow monitors currently utilized by MWS is discussed in **Management Program, Section V.f.v. Flow Monitoring.**

### **Recommendation**

MWS will review and update the Wastewater Capacity Management Plan following the completion of the conversion of the sewer model. The update will be complete by January 2009.

The Master Sewer Growth Plan will be renewed and updated every five years.

### **Sewer Model**

Since 1990, MWS has utilized Bracwell Engineering's SWRMDL software. Starting in 2005, MWS began the upgrade to a dynamic sewer model of the collection system using the EPA SWMM model. DHI's MIKE URBAN, which uses the SWMM 5 model engine, was chosen as the new modeling software. The conversion is currently underway.

Data from the flow monitoring network is used to calibrate the sewer model annually.

The sewer model is also used for master planning. MWS updated the Master Sewer Growth Plan in December 2003 utilizing population projections for 2010 and 2025. Future projects were identified and will be placed into the capital budget at the appropriate time.

### **Recommendation**

MWS will complete the conversion of the sewer model into the MIKE URBAN software by April 2007.

## **VI. Overflow Tracking**

Collection system overflows are either caused by I/I, mechanical failure, or line blockage. All are corrected as soon as possible, and all are tracked for reporting. Dry weather overflows are reported to the TDEC within 24 hours of discovery in accordance with the Sewer Overflow Response Plan (Appendix I). All overflows (wet weather and dry weather) are reported to TDEC on the monthly overflow report.

## **VII. Financial Analyses**

### **a. Cost Analysis Program**

The purpose of the Cost Analysis Program is to regularly evaluate MWS's costs associated with operating and maintaining the infrastructure of the sanitary sewer



collection system and treatment facilities. The goal of the program is to ensure that current and future funding is adequate for:

- Cost effective performance of all operation and maintenance activities
- Funding all aspects of the annual departmental budgets for operations, debt service, and associated reserve funds
- Funding the infrastructure needs set forth in the Wastewater Capacity Management Plan

MWS maintains a monthly, running budget analysis of current year-to-date expenses against original budgeted expenses as submitted to the Metro Finance Department and approved by the Metropolitan Council. Under the supervision of the Director, MWS currently maintains 78 individual business units within the department related to management, operations, and maintenance activities. A copy of this monthly analysis is submitted to and reviewed by all management and supervisory personnel. This allows for the control and planning of future expenditures for the remainder of the fiscal budget year. The monthly cost reports are also summarized by Division to permit a general overview of each Division's financial performance. Monthly cost report summaries are also available for MWS as a whole.

Prior to submission of MWS's budget request for the upcoming fiscal year to the Metropolitan Council, an external analysis is performed of the budget request by a rate consultant to ensure the projected revenue stream meets or exceeds the minimum level of funding as required by MWS's bond covenants. As an enterprise funded department, an end of fiscal year financial report is generated annually for the prior fiscal year budget period which serves as a base financial report for the external auditor in preparation of MWS's section of the Metropolitan Government's Comprehensive Annual Financial Report (CAFR).

MWS participates in several benchmarking studies including the AWWA QualServe Benchmarking Study and the Raftelis Financial Consulting Water and Wastewater Rate Survey. A cost of services study is performed approximately every five years to ensure the existing rate structure is adequate to cover the costs of MWS. A rate study is also performed approximately every five years to analyze the current rate structure and recommend any changes necessary to meet existing obligations to capital, operations, and debt service. The most recent cost of services study was completed in 2004; the most recent rate study was issued in 2006.

MWS's website includes a copy of the cost of services study ([http://www.nashville.gov/finance/audit\\_reports.htm](http://www.nashville.gov/finance/audit_reports.htm)). A copy of the rate study is provided in Appendix J.

## **b. Capital Improvement Financing Program**

The Capital Improvement Financing Program (Appendix K ) for MWS analyzes, projects, plans, and finances capital improvement needs established through engineering review and prioritization. Currently, capital improvement financing is planned using a rolling five year planning period.

The purpose of the Capital Improvement Financing Program is to provide MWS with information and guidance related to improving the existing treatment and collection systems in MWS's service area. The rolling five year plan is incorporated into the cost of service and rate study updates.

MWS's annual capital budget is approved by the Metropolitan Council. MWS's Asset Management Committee meets bi-weekly during the fiscal year to consider and authorize expenditures from the approved annual capital budget.

Funding for wastewater capital improvements is primarily provided by customer sewer rate revenues and loans obtained through the State of Tennessee. Two sources of State loans for wastewater capital infrastructure are utilized:

- Clean Water State Revolving Fund loan (CWSRF) program administered by TDEC
- Tennessee Local Development Authority (TLDA) loan program, which establishes a sewer surcharge on customer sewer revenues to be used to fund the debt service on these loans

When necessary, MWS has issued revenue bonds to fund large scale wastewater projects.

## **c. Budget and Customer Rate Program**

As discussed in **Management Program, Section VII.a. Cost Analysis Plan**, an external analysis of the annual revenue and operations budget request is performed to ensure the projected revenue stream meets or exceeds the minimum level of funding as required by MWS's bond covenants. Substitute Resolution No. R85-762 addresses the covenants with the bond holders and is referenced in future issues. Section 7.8 of the resolution discusses the 110% revenue requirement and its computation.

### **i. Budget**

MWS follows the guidelines set forth in the Metropolitan Council's annual budget ordinance. This ordinance is administered under the supervision of the Metropolitan Finance Director within the Metropolitan Finance Department.

MWS prepares a monthly budget analysis to assess current expenditures against budgeted amounts for internal management. A Budget Accountability Report (BAR) is submitted to the Metropolitan Finance Department on a monthly basis. MWS provides budget updates with budget projections to the Metropolitan Mayor,

Metropolitan Council, and Metropolitan Finance Director through annual budget hearings.

MWS conducts quarterly meetings referred to as Departmental Review of Performance (DROP) where employee groups, council members, and other Metropolitan Government representatives are invited to hear a quarterly and year-to-date review of MWS's operational and financial performance.

Budget worksheets, financial reports, and DROP presentations are stored on MWS's shared network for historical reference by employees.

## **ii. Customer Rates**

As discussed in Management Program, Section VII.a. Cost Analysis Program, MWS commissioned a comprehensive cost of service study to analyze and verify the true cost of providing water and wastewater services to MWS's customer and wholesale customer base in 2004. The cost of service study was followed by a rate study in 2006 to determine the most appropriate mix of water and sewer rates necessary to cover the costs as identified in the cost of service study. The results and recommendations of both studies were presented to the Metropolitan Finance Director and Council for consideration and action.

All CMOM programs were included in the cost of service study and the rate study.

Other fees charged by MWS such as customer service fees, capacity fees, and inspection fees, are periodically reviewed for changes in their cost basis to ensure full cost recovery by MWS.

# **VIII. Equipment and Supplies**

## **a. Spare Parts, Tools, and Equipment Inventory Program**

The Stores Management Section of the Systems Services Division is responsible for maintaining the materials and spare parts necessary for the operation of MWS. The materials, parts, and supplies are housed in two secure warehouses and at the pipe yard. The pipe yard is contained in a secure fenced area with security cameras. Table 2 is a list of essential inventory located in these areas.

Table 4-2. Spare Parts Inventory

**Pipe Yard**

4" - 18" PVC sewer pipe  
 2" - 36" Ductile iron (DI) pipe  
 Ductile iron fitting (various types)  
 Manhole frame and covers  
 Meter box risers  
 Manhole adjustment rings  
 Fire hydrants  
 Fire hydrant parts

**Warehouse**

4" - 24" PVC fittings  
 4" - 12 " Couplings (Fernco) PVC to PVC  
 4" - 12 " Couplings (Fernco ) PVC to DI  
 4" - 12 " Couplings (Fernco) DI to clay  
 4" - 12 " Couplings (Fernco) DI to DI  
 Hand tools (shovels, rakes, sledge hammers)  
 Safety supplies  
 Jet truck equipment TVI camera equipment  
 Disinfectant supplies  
 Cleaning supplies  
 Brass & galvanized service line fittings

Equipment for cleaning and repair crews is stored on each respective truck. See **Maintenance Program, Section II.a. Routine Hydraulic Cleaning Program** for a list of the available equipment.

Work crews are required to provide a material release order form that lists the materials, parts, or supplies needed for a particular project. One member of the crew must be on an approved list to sign for materials, parts, or supplies. If no member of a crew is on the approved list, a supervisor must approve the form before items can be released from the warehouse or pipe yard.

All materials, parts, and supplies are on an inventory list and are cycle-counted each month. The inventory is maintained in the CMMS. Each employee of the Stores warehouse has a different function related to inventory to prevent any overlap among job duties. Most items procured are purchased by contract and through the use of a procurement card; this accelerates the receiving process of materials, parts and supplies by approximately four weeks. Purchase orders are used for special non-contract items and for fire hydrants. Local suppliers on contract are used whenever possible. This has allowed MWS to reduce the inventory that is onsite for items that are readily available. There are numerous local suppliers available to MWS which enables them to contact multiple suppliers until a part is located. If one supplier does not have a needed part on hand, MWS has the authority to obtain parts in an emergency without the delays sometimes associated with paperwork.

**b. Fleet Management and Repair**

In June 2003, Metro consolidated vehicle/equipment repairs previously performed by individual departments such as General Services, Water Services, Public Works, and Fire into the Office of Fleet Management (OFM). MWS now utilizes OFM for repairs and preventative maintenance on vehicles and equipment.

Maintaining repair and detailed preventative maintenance data is the responsibility of OFM for vehicles and equipment and is available to MWS if requested. Work performed in-house on stationary generators and pumps including inspections and preventative maintenance is also tracked in the OFM system.

OFM maintains two shops: the Heavy Equipment Shop and the Light Vehicle Repair Shop. Recently a third shop, Grounds Equipment Maintenance, was relocated to the Light Vehicle Repair Shop.

MWS continues to supplement vehicle/equipment needs in-house for small items such as emergency road service, replacing light bulbs, adding oil or other fluids, and inflating tires. These services are provided to avoid unnecessary travel and downtime of vehicles/equipment, operators, and crews. Two full time employees assigned to the Fleet/Generator Services Section of the System Services Division perform these services. All service work performed on vehicles and equipment is reported to OFM for inclusion in the preventative maintenance record.

The Fleet/Generator Services Section is also responsible for quarterly inspections and annual preventative maintenance on the engines of all stationary backup generators and engine driven pumps at all MWS facilities. Minor repairs are also performed by the Fleet/Generator Services Section; more involved repairs are usually referred to a contract vendor and monitored for completion by the section's staff. These functions are coordinated with the Route Services Section of the Operations Division or the effected plant.

Additionally, the Fleet/Generator Services Section personnel provide other support functions for MWS as required. These tasks include transporting heavy equipment to job sites and to OFM for repair, operating crane trucks for special lift jobs, and operating pumps when required to assist repair work at pumping stations or in the distribution and collection system.

The Fleet/Generator Services Section utilizes the CMMS for inventory and to track vehicle and equipment assignments.

The Fleet/Generator Services Section coordinates with OFM on required repairs needed in the field as well as monitoring downtime of vehicle and equipment and coordinating with OFM Shop Supervisors to maintain an adequate number of each type of equipment in service. OFM generates a daily status report on all units in for repair or preventative maintenance. Request for priority repairs on MWS special use units, such as water and sewer repair and maintenance equipment, is normally honored by OFM.

The Fleet/Generator Services Section also coordinates a vehicle/equipment pool of varied light trucks and specialty trucks and equipment that is available as back up for down equipment or for temporary special needs.

The MWS Safety Office, as well as the Fleet/Generator Services Section, performs periodic and spot checks on vehicles and equipment for safety issues and maintenance needs. All commercial driver license drivers are required to perform "walk around" safety checks by their license. All drivers/operators are responsible for the operation and safety of the equipment they use and are required to report any deficiencies or potential problems to the Fleet/Generator Services Section or OFM for correction.

## **IX. Customer Service**

### **a. Complaint Management Program**

The MWS Phone Center and Dispatch are both located at the Customer Service Center. The Phone Center takes customer calls for various divisions of MWS, such as, Customer Service, System Services and Storm Water. The primary function of Dispatch is to answer all incoming emergency calls for MWS. Dispatch also answers rollover calls from the Phone Center. If a call is received from a customer pertaining to a problem with their meter, a service request (Appendix F) is initiated in the CMMS and dispatched to Customer Service Field Activities. If a call is received regarding a storm water issue, a service request is initiated in the CMMS that goes directly to the Storm Water Division. If there is an emergency call related to sewer issues or a possible main break, a service request is initiated in the CMMS and the order goes to the System Services Division.

The call center answers an average of 53,000 calls per month, including emergency calls. The majority of these calls are due to billing problems.

For after-hour calls, Dispatch contacts the appropriate MWS personnel based on the on-call list provided by the System Services Division each week. A manual with documented processes for entering the various types of service requests into the CMMS is available for Dispatch.

Dispatch opens and closes all CMMS service requests and work orders except for sewer CCTV and cleaning. In those cases, service requests are closed by the employee to whom they are assigned

### **b. Public Information Program**

MWS has a full time Public Information Officer responsible for public outreach and education.

#### **i. MWS website**

The MWS website provides information to the general public regarding the organization's current projects and on-line seminars ([www.nashville.gov/water](http://www.nashville.gov/water)). General information regarding the organization includes environmental compliance, historical information, rates and payment methods, residential and commercial development process, trades advisory council, water quality reports, and the wastewater treatment process. The current projects discussed are the Overflow

Abatement Program and the Biosolids Management and Odor Control Project. The seminars discussed include on-line slide presentations regarding recent issues on various watersheds, as well as the storm water permitting process and US Army Corp of Engineers regulatory program.

#### **ii. Construction Notification Letters**

Letters are sent to property owners and the respective council person regarding upcoming projects prior to the start of construction. The letter gives details such as start date and completion dates of construction, project information, and contact numbers for questions or concerns.

#### **iii. Community Meetings**

Neighborhood association meetings and community meetings are utilized to answer questions and concerns regarding ongoing projects or to address general questions regarding MWS.

#### **iv. E-mail Newsletters**

Project updates are sent to effected residents or entire neighborhood groups via email when projects extend over a long period of time or a large area.

#### **v. Media**

Radio, television, and print media are utilized when necessary to reach the public immediately concerning issues that may adversely affect them. Television and radio are utilized during construction projects to alert the public of traffic concerns or water outages that would affect a broad area. Print media is utilized to announce large projects and improvements to the system.

#### **vi. OAP "Hot-Line"**

A "Hot-Line" telephone number to call with questions or complaints was established in the first year of the OAP. The "Hot-Line" answers concerns about construction and/or other aspects of the program.

Due to a low volume of calls, it was decided that a dedicated line was no longer needed for the "Hot-Line". The phone number for the "Hot-Line" now goes to a staff member of the OAP.

#### **c. Public Education Programs**

MWS uses a variety of programs to educate current wastewater customers and other effected entities including:

- Wastewater treatment plant tours
- Wastewater brochure
- Grease management video

- Sewer cam demonstrations presented at the Tennessee State Fair and summer camp programs.
- Dyed water flooding brochures
- "Don't Dump On Us" campaign to address the difference between combined and separated sewers
- Letters sent to all Metro Nashville public and private schools describing programs and presentations offered
- Programs and presentations promoted through the Mayor's Office of Neighborhoods

### **OAP Community Education Program**

The importance of community education and buy-in is essential to the success of the OAP. The community outreach and public education program addresses specific segments of the public that have unique interests in the decisions made to control CSOs. These segments vary from customers whose rates may be affected by CSO construction projects, to citizens and groups having concerns about cleaning up the environment, to the general public whose normal activities may be affected. It is critical to the program that all concerned parties understand the goals and importance of the OAP.

Two specific examples of education and community outreach efforts are the Bypass Review Committee and the CSO Advisory Group.

Because of the importance of having contractual, technical and financial details to answer questions, present results and to insure that presentations are prepared to truly address the concerns of the intended audience, MWS implemented a Bypass Review Committee. This committee is made up of representatives from each of the responsible divisions within MWS. The committee reviews and analyzes both SSO's and CSO's from the previous month. Recommended actions are developed and the committee continues their involvement from the initial proposal through the completion of the construction of the project. One of the tasks of the committee is to recommend and assist with media presentations and recommend the utilization of professional media companies for major projects.

The CSO Advisory Group was established several years ago and consisted of representatives from different interest groups from public and private sector organizations. This group was deemed unnecessary following the completion of the major projects within the CSO system. If warranted, the Bypass Review Committee will recommend the formation of a new group.



The MWS website, [www.nashville.gov.com](http://www.nashville.gov.com) is updated monthly and is linked to the MWS website. This site contains complete information regarding the OAP including project listings and reports.

TDEC is responsible for assuring that the best interests of the State and its citizens are being served by the actions of the OAP. It is critical that the public understand that the work that is being done is required and that it is helping to achieve compliance at reasonable costs.

From the beginning of the OAP, the public has expressed interest in what was being planned, designed and constructed using funds collected from water and sewer bills. Representatives of MWS and their consultants have spoken to community groups on several occasions. These types of meetings will continue as new OAP projects are proposed.

To keep the Metro Council informed on the OAP, letters are sent to each councilman describing forthcoming work in their district. List of citizens have been developed for each project area and separate letters are sent to them describing the project, the duration of the project and any potential construction inconveniences.

## **X. Legal Support**

### **a. Inter-Jurisdictional Agreement Program**

The Metropolitan Government of Nashville and Davidson County (Metro) is distinctive in that it is a consolidated city and county form of government. Several satellite municipalities and utility districts within Davidson County and the immediate vicinity have entered into inter-jurisdictional sewage transport and treatment agreements with Metro.

Metro will be renegotiating a new agreement with the existing satellite municipalities and utility districts, based on the results from a recent rate study (**Management Program, Section VII.a Cost Analysis Program and VII.b. Capital Improvement Financing Program**). The new rate study addresses the need for a capital cost recovery component to the rates, which when in effect, will expand the responsibility for MWS to provide capacity. The new agreements will dictate the volume of wastewater flow and may include peaking charges and limitations. No restrictions on the rate of growth are anticipated. Table 3 lists the satellite municipalities and utility districts and the status of MWS's current inter-jurisdictional agreements.

An example of one of the inter-jurisdictional agreements is located in Appendix L.

**Table 4-3: MWS's Inter-Jurisdictional Agreements Status**

<b>Wastewater Agency</b>	<b>Agreement Expiration*</b>	<b>County</b>
<b>Cities:</b>		
City of Belle Meade	Under negotiation	Davidson
City of Brentwood	Under review	Williamson
City of Goodlettsville	7/1/2008	Davidson/Sumner
City of Millersville	Under negotiation	Sumner
City of Mount Juliet	6/22/2029	Wilson
City of Ridgeway	5/20/2017	Davidson/Robertson
City of La Vergne	Under negotiation	Rutherford
<b>Utility Districts:</b>		
Hendersonville	3/1/2008	Sumner
Old Hickory	4/1/2008	Davidson
White House	10/1/2016	Sumner/Robertson

\* For agreements that have expired, MWS is operating under the requirements of the expired agreement and is currently re-negotiating the agreements.

## **b. Sewer Ordinance Program**

Metro's Code of Laws, Title 15 contains the provisions of the Code relative to water, sewers, and other public services. The Code is periodically revised and was amended in order to comply with current regulations of the EPA and the State of Tennessee, specifically the Clean Water Act. The Code is available to the public in Metro's Clerk's Office or on MWS government website:

[http://www.nashville.gov/images/gifs/mc/code\\_of\\_laws/TITLE\\_15.pdf](http://www.nashville.gov/images/gifs/mc/code_of_laws/TITLE_15.pdf)

The administration and enforcement of the Code is the responsibility of the Director and the Wastewater Hearing Authority. The Wastewater Hearing Authority, as mandated by Section 15.60.350, is a five member board appointed by the Mayor and has full enforcement authority over sewer system compliance issues. Their duties include:

- Investigative authority
- Review of submittals to State
- Adoption and approval of enforcement actions

- Assessment of fines for discharge of materials that have a detrimental effect on MWS sewer system

The Code addresses pretreatment requirements, new and existing system connections, rates and charges, and various system use regulations. MWS has enforced this ordinance against storm water discharge into its separate sewer system as a measure against sanitary sewer overflows. See **Operation Program, Section IV. Fats, Oils, and Grease Control Program** and **Operation Program, Section II. Pretreatment Program** for more details.

## **XI. Water Quality Monitoring**

### **a. Routine and Investigative Monitoring**

Through a series of water quality modeling studies that date back to 1975, MWS has gained considerable knowledge of the response of the Cumberland River to not only MWS discharges but also to urban, rural and natural sources of pollution.

In 1988, the Combined Sewer Overflow Study for the Cumberland River and Browns Creek was completed in accordance with an agreed order between MWS and TDEC. The goals of the study were to identify pollution sources to the Cumberland River and its tributaries.

Since the writing of the CSO study, several environmental studies have been performed at a cost of over \$2 million. This solid background of investigations and resulting construction has led to the recognition of the importance of a comprehensive monitoring program. MWS currently has extensive laboratory facilities and sampling capabilities in place and will continue to maintain these investments and refine the sampling efforts.

Continuous study since 1988 has given MWS a wealth of water quality data. This data provides a detailed picture of conditions before extensive CSO remediation efforts were completed as well as a dynamic picture of the changes that have taken place as solutions have been implemented.

### **River Sampling Program**

In the mid 1970's, MWS began to perform routine, detailed monitoring of the Cumberland River as it flows through Davidson County. Initially, laboratory personnel traveled a 50 mile segment of the Cumberland River between Old Hickory Dam and Ashland City, Tennessee. This segment comprises that portion of the river that lies within Davidson County. Situated along this segment of the river are Nashville's two water intakes and three wastewater discharge points as well as all of MWS's sanitary sewer collection system and drinking water distribution system.

The focus of sampling and monitoring changed as knowledge of the river has increased and monitoring technology has evolved. Initially, water quality samples were collected and field analyses were performed weekly at intervals of approximate

every 4 miles and at strategic locations to document the status of the river and provide water quality protection. Current efforts have narrowed the focus to 15 mile segments of the river impacted by MWS's intakes or outfalls.

The parameters monitored are dissolved oxygen, temperature, pH, total phosphorous, nitrates/nitrites, chromium, copper, nickel, zinc, fecal coliform and *E. coli*. In addition, personnel observe and document water coloration and clarity, flow rate, and depth. Unusual or illicit discharges are noted and investigated. Wildlife is observed and recorded as well as any indications of distress in aquatic animals/plants.

Data is reported to TDEC on a monthly basis. Additionally, all data is entered into a river run database located on MWS's intranet and is accessible to all MWS users. At this time, it is not available to the general public online.

### **Tributary Monitoring Program**

As MWS's knowledge of the Cumberland River grew, it became apparent that river bacterial levels were largely determined by the major tributaries along the Davidson County segment. Tributaries such as Mill Creek, Brown's Creek, Richland Creek, White's Creek and several other smaller streams, were found to have significant bacteriological impacts on the Cumberland River.

Initially intended to provide data for the CSO program, the Tributary Pollution Source Study quickly became an important part of MWS's Watershed Protection Program. Initiated in 1995, the study was a joint project between MWS, Vanderbilt University and an engineering consultant. Extensive sampling and monitoring of ten tributary streams verified that MWS's sewer system does affect the water quality of the tributary streams in some locations. However, the majority of fecal coliform concentrations are a result of non-sewer related sources of contamination.

MWS's focus had been to identify and eliminate sewer overflows from the waters of Davidson County. This study showed that even after overflows are removed, fecal coliform concentrations in tributary streams and the river will continue to violate water quality standards when there is runoff from rainfall.

The impact of septic tank seepage on the background sources of fecal coliform concentrations was also a part of the study. It was concluded that any septic tank leachate impact on tributary bacterial loading is masked by other sources such as animal feces in surface runoff. However, the study did confirm that sources other than the sewer system have a large impact on the water quality of the streams.

In 1998, an annual water quality program called the Tributary Continuation Program was begun by MWS with the same joint venture partners as previous. The project built on the more than 10 years of water quality documentation and was an effort to discover and characterize each of the sources of pollutants. The results further documented the progress being made by the OAP and provided information

concerning the various options in identifying the sources of pollution in the environment.

Monitoring consists of quarterly sampling events within each tributary drainage basin. Samples are collected during dry periods to avoid the influence of non-point source runoff as well as during rain events for comparison. Samples are collected at various locations along each tributary and are analyzed for fecal coliform and *E. coli*.

A result that exceeds half of the state bacterial water quality level triggers a resample and a field survey to attempt to identify the source. Dry weather macroinvertebrate sample collection and dry weather walking surveys of each tributary have also been conducted.

Data is reported to TDEC on a routine basis. Data is reviewed in-house to direct subsequent investigations and direct corrective actions. Data is also used to address TDEC's 305b and 303d listings.

### **River Modeling**

EPA's CSO program compelled MWS to gain a better understanding of the hydrology of the Cumberland River and to evaluate the potential water quality with numerous conditions and discharge concentrations. Studies of the river began with a study of the wastewater assimilative capacity of the river in 1975. With the assistance of Vanderbilt University, three water quality models were examined, BETTER (Box Exchange Transport Temperature and Ecology), WASP4 and CE-QUAL-W2. The BETTER model did not predict well concentrations of biochemical oxygen demand, ammonia and other significant parameters. The WASP4 model was too complex for practical use. CE-QUAL-W2 was chosen because it was suited for long, narrow water bodies and the data collected in the BETTER model could be utilized.

Several reports and studies were completed using this modeling software. One of the final analyses conducted examined two simulated rainfall events in three scenarios. The scenarios included:

1. Expansion of Central Wastewater Treatment Plant to provide increased treatment capacity, a second tunnel and other system improvements. The estimated overflow frequency was 30 to 40 times per year.
2. Construction of detention basins to reduce overflows to eight per year.
3. Construction of facilities to eliminate overflows.

The modeling results indicated an insignificant difference in the three scenarios. This indicated that tributary streams were the significant source of coliform in the river not the CSOs. This realization led to the conclusion that the plans to construct multiple detention basins to limit CSO overflows to eight times per year would have little impact.

This significant finding had a monumental impact on the Long Term Control Plan and the OAP. As a result of these findings, the program emphasis shifted to removing SSOs and finding less expensive solutions for the CSOs.

### **Source Identification**

As a result of the river sampling program, the tributary sampling program, and river modeling efforts, it became apparent that discharges from the combined sewer system were not significant contributors of bacterial contamination in the Cumberland River or its associated tributaries. State water quality regulations do not differentiate violations based on bacterial sources. An exceedance of the bacterial limit is a violation regardless of the source of the bacteria. Because much of MWS's sanitary sewer system is located in close proximity to many of the tributary drainage basins in Davidson County, the sewer system is subject to "guilt by association" when exceedances occur.

A joint venture between MWS, an engineering consultant, and Vanderbilt University evaluated several source tracking technologies. Multiple Antibiotic Resistance Analysis (MARA) was determined to be the best method that gives a high percentage of accuracy in efforts to identify sources of bacterial contamination. The method is based on the theory that differences in fecal bacteria resistance to certain antibiotics can be statistically related to the environmental exposure to antibiotics of the host species. The program distinguishes animal from human and can categorize the animal results. This method contributed to the identification of possible sewer system deficiencies but was equally important for the identification of other contributing sources of pollution.

The information developed from this program was transmitted to TDEC on a routine and/or as needed basis and was stored on MWS's intranet. The MARA Program was discontinued in 1994 when the contract with the engineering consultant and Vanderbilt University ended.

### **USGS Continuous Monitoring**

MWS has entered into a 50/50 partnership with the United States Geological Survey (USGS) to provide continuous real-time water quality monitoring of the Cumberland River. The USGS provides the installation, maintenance and half the cost of two continuous water quality monitoring stations in the Davidson County segment of the Cumberland. One site is located above the downtown reach of the river and above the CSO area. The second site is located below the downtown reach of the river, and below all but one known CSO outfalls.

These monitors provide continuous real-time data on the dissolved oxygen, pH, conductivity, and temperature of the river at those locations. This data is available from the USGS on the internet to the general public.

### **Plant Protection Criteria Monitoring**

Plant Protection Criteria (PPC) monitoring is performed quarterly on the final effluent from each of MWS's three wastewater treatment facilities that discharge into the Cumberland River. PPC sampling and analysis consist of an exhaustive list of parameters designed to demonstrate compliance with EPA's Pretreatment Program regulations and to protect water quality in the receiving stream. This data is reported to TDEC twice yearly in the Semi-Annual State Report. This is a comprehensive report on all activities undertaken as part of the pretreatment program for the previous six months.

### **b. Impact Monitoring**

MWS may collect samples after an SSO and have analyses performed depending on the nature of the incident. If MWS determines that a specific overflow is a public health concern based on site conditions, samples are taken in areas close to residential developments and in the urban streams receiving the discharges. A formal report is not generated of these sampling events.

## **XII. Contingency Plan for Utility Infrastructure**

### **a. Contingency Planning Program**

MWS has developed a comprehensive Emergency Preparedness Plan that was revised in July 2006.

Depending on the nature of sewer service interruption, there are several methods incorporated to restore service and protect the environment. At pumping facilities and treatment plants, operational redundancy is present in the event of mechanical failure. The same is true for many locations in the event of power outages. Many facilities have on-site power or duplicate electrical power feed. Those without on site back-up power are restored to service with portable generators (see **Operation Program, Section I.b. Reactive Operation Program**). For the piping network, line stoppages are removed as soon as is possible once reported. For pipe failure, by-pass pumping to downstream manholes and/or vector support is incorporated. All temporary actions of this type are maintained until full service can be restored.

More details on the plan can be found in a copy of the Emergency Preparedness Plan located in Appendix M.

### **b. Preparedness Training**

MWS conducts various drills and emergency equipment checks to ensure all personnel are prepared in the event of an emergency. MWS has developed chemical evacuation plans for all locations. These drills are performed every six months. Security preparedness drills are performed quarterly in cooperation with the Police Department's SWAT team. Reports and debriefings are held after each exercise.

Emergency communications checks are performed every quarter. All emergency responders have direct talk and 800 MHz radios. Direct talk is used for day to day communications. All 800 MHz radios are checked by each user by contacting the Omohundro WTP control room. The users that do not check-in are contacted to determine why.

Emergency generators are tested monthly with preventive maintenance checklists.



# **Section 5. Operation Program**

## **I. Pump Station Operation**

### **a. Preventative Operation Program**

MWS operates 101 pump stations within the sanitary sewer collection system. The stations operate independently based upon wastewater levels in the station wet wells. Operations are controlled by a programmable logic controller (PLC) located at each station that contains site-specific operational parameters for each pump station. All pump stations are monitored remotely at the Omohundro WTP Control Room 24 hours per day, 7 days per week, 365 days per year.

The elements that comprise pump station operations are in place to ensure pump station reliability for both dry-weather and wet-weather wastewater transmission.

### **i. Pump Station Monitoring**

All pump stations are currently equipped with remote terminal units (RTUs) manufactured by HSQ. The system transmits all telemetry data through a 900 MHz, spread-spectrum radio network to the Omohundro WTP control room. The control room serves as a central location for the supervisory control and data acquisition (SCADA) system that monitors and manages the collection and distribution systems. The existing interface is also being improved by integrating the HSQ (Wastewater) and Intrac (Water) systems into a consolidated system manufactured by Citect.

The current operations status of all pump stations is monitored 24 hours per day for the following:

- Number of pumps in operation
- Status of pumps including operational alarms
- Pump start/stop cycles
- Power status including power failure alarms
- Wet well conditions (depth, lead/lag elevations)
- Personnel status (entry/exit alarms)

The current operations status of the major pump stations is also monitored for the following:

- Pumping flow rate
- Equipment vibration and temperature
- Equalization basin levels (where located)

The upgraded SCADA system will record monitored activities at each pump station on dual data servers. The additional data server will provide read-only operational data to other MWS sections including Engineering, System Services, and Customer Service. Data may be trended for further analysis or printed for backup documentation.

### **Recommendation**

MWS will complete the integration of HSQ and Intrac into a consolidated system by October 2007.

### **ii. Pump Station Operations**

Although MWS does not have a formal written Reactive Operation Program, operational guidelines dictate the manner in which pump station operations are conducted in the event of an emergency.

Pump station operations and maintenance is primarily the responsibility of the Route Services Section of the Operations Division of MWS. Currently, the Route Services Section has 33 full-time employees responsible for both water and sewer pump stations with additional assistance available from mechanics and electricians located at the five treatment plants. Route Services Section crews consist of one electrician and two mechanics; both are trained in performing operations and maintenance on wastewater pump station equipment.

Seven full-time technicians stationed at the Omohundro WTP are responsible for calibrating and maintaining all telemetry, flow meters, and level control devices for the pump stations. Employees from the Electronics and Route Services Sections coordinate daily station maintenance activities. Supervisors may also request that the respective section managers reallocate available resources as needed to ensure that all work orders can be completed efficiently.

The predictive maintenance team visits both water and sewer pump stations regularly to monitor equipment vibration and temperature and to take oil samples for laboratory analysis. The pump stations are divided into one monthly route, two quarterly routes for water pump stations, two quarterly routes for sewer pump stations, two semi-annual routes for water pump stations, and two semi-annual routes for sewer pump stations. The pump stations were placed into each route based upon the existing vibration levels and historical reliability of the equipment in the pump stations. The routes are re-evaluated and changes made on an ongoing basis to the schedules when it is noted by the maintenance team that the frequency of inspection needs to either increase or decrease. The data that is gathered enables MWS to proactively target equipment for replacement or refurbishment reducing the probability of simultaneous pump failures and reductions in station capacity.

All activities performed by these personnel are documented in CMMS. This software is used to produce regularly scheduled predictive and preventive maintenance work orders, as well as assign corrective or emergency work. Work orders are assigned to

each Route Services Section crew according to geographic area or maintenance zone. Once the work is completed, the work order information is entered into the software to allow performance tracking, labor budgeting, and to provide historical equipment information for the station equipment. The historical data is entered into the CMMS to allow the MWS management group and the predictive maintenance team to utilize it. The management group uses the data to determine operating efficiency and work volume. The predictive maintenance team uses the data to gauge the effectiveness of the predictive and preventative program and to determine if there is an increase in unscheduled maintenance.

Wet well control points (lead/lag operating elevations, etc.) for each station are set by the design engineer based upon the pump manufacturer's requirements for wet well operating levels and pump starts/stops per hour. The Electronics and Telemetry Sections employees check these operating points on a recurring basis and recalibrate the control equipment as necessary.

As-built plans for each station are maintained by the Records & Mapping Section of the Engineering Division.

### **iii. Operation and Maintenance (O&M) Manuals**

Operation and maintenance (O&M) manuals for all equipment are located in the Route Services Section office complex. Backup copies of the manuals for most stations are located in the Administration Building library. Manuals are cataloged by pump station name and are accessible by all MWS personnel responsible for operations and maintenance of pump stations and engineering staff. When pump stations are upgraded or major equipment is replaced, new equipment manuals are received and filed with the station's O & M manual.

### **Recommendation**

MWS will investigate the feasibility of implementing the requirement of electronic O&M manuals for all projects by December 2007. If it is determined that this is feasible, a new goal will be established to implement the requirement.

## **b. Reactive Operation Program**

As stated in the Preventive Operations Program section, all wastewater pump stations are operated by the station's PLC and remotely monitored in the Omohundro WTP control room. The pump stations are monitored continuously with data being collected by a SCADA system located in the control room. On-duty operators monitor the SCADA system for visual and audible alarms pertaining to pump station operations.

### **i. Pump Station Design**

TDEC design requirements establish a station's rated capacity as the station's conveyance ability with the largest pump out of service. This requirement allows a

pump station to continue to operate under design conditions should a pump experience mechanical problems.

In the event of an interruption of power at the station, power may be supplied at all of the pump stations by redundant power feed, on-site stationary emergency generator, or portable generator. As a general rule, the type of emergency power available is dictated by the size of the station. The two largest pump stations, West Park and Brown's Creek, have a redundant power feed. Stations with a rated capacity exceeding one MGD typically have an on-site stationary emergency generator. Stations with rated capacities less than one MGD typically rely on a portable emergency generator as a backup power source. MWS currently has a pool of 11 portable generators. Based on the current use of these generators, this seems to be a sufficient number. Several of the units are approaching twenty years old; the run time hours are low. Reliability has not been an issue; however, the generators are assessed as part of the inspection program to determine when replacement is necessary.

Spare pumps are available for several of the smaller stations. When costs for pump repairs are compared to the cost of a new pump, in many situations it is more cost effective to replace the pump. Many times the decision is simple to make because of the significant difference in raw cost of the new pump as compared to the repair costs. In other scenarios, the repair cost versus the new pump cost with a five year warranty is evaluated.

The spare pumps are stored at the Route Services warehouse and the Old Airport Pump Station.

## **Recommendation**

MWS will develop and implement standard operating procedures for tracking the inventory of spare pumps for the smaller pump stations. It will be determined if this can be tracked through CMMS. The implementation of these procedures will be completed by December 2007.

### **ii. Reactive Pump Station Operation**

Reactive operations for pump stations are initiated by the SCADA system telemetry located at each pump station. The station telemetry monitors established points for power failure, high wet well, pump failure, motor failure, excessive vibration, excessive temperature, and unauthorized entry. The RTU sends the alarm to the Omohundro WTP control room. The on-duty operators have an "on-call" list of personnel to notify. The "on-call" list contains employee contact information for the following personnel:

- On-call route crew (mechanic and electrician)
- On-call Industrial Maintenance Supervisor
- Route Services Manager

■ Assistant Director, Operations Division

These personnel are qualified and have the authority to exhaust all available resources necessary, including emergency contracts for back-up pumps, motor and machine shop work, to return a pump station to normal operation. Once notified, the Route Services Section crew will arrive at the pump station to take corrective action or contact and dispatch the appropriate maintenance personnel to address the situation. All maintenance personnel are equipped with cell phones with direct talk capabilities.

MWS also has a second "on-call" backup list and a third "on-call" backup list to ensure that necessary personnel are able to be contacted when needed. This protocol for responding to emergency situations has demonstrated itself to be effective for MWS.

The Maintenance Section personnel are properly equipped to handle reactive operations in a safe and efficient manner until normal operations can be re-established. Mechanical route trucks have a significant amount of storage area for hand tools, spare parts, and fittings. Four maintenance trucks are also equipped with a heavy-duty crane and an air compressor. The MWS fleet has a boom truck to pull equipment that exceeds the capacity of the cranes on the maintenance trucks. Vactor trucks are available from both the Central WWTP and the System Services Division for any pumping and/or cleaning and transport. MWS also maintains a contractual relationship with local vendors for emergency delivery of machine work and motor repairs. These contracts stipulate a two hour response time and for pump/motor emergency repair work, the workers are to utilize multiple work shifts 24 hours a day, 7 days a week until the work is completed.

MWS is prepared to handle pump station operations during a power outage as discussed in **Operation Program, Section I.b.i. Pump Station Design**. In the event of an interruption of power at the station, power may be supplied at all of the pump stations by redundant power feed, on-site stationary emergency generator, or portable emergency generator.

MWS is on a priority list for NES to respond to power outages. NES management contact information has been made available to MWS for after hours contact in the event an issue cannot be resolved quickly by NES staff.

### **Recommendation**

MWS will develop and implement Standard Operating Procedures for critical operations programs. The SOPs will include a means for follow-up on any items noted that need attention. These SOPs will be ready for implementation by December 2008.

## II. Pretreatment Program

MWS's Industrial Pretreatment Program (IPP) includes requirements for inspections, sampling, permitting, surveillance, and enforcement of non-domestic sewer users that discharge to MWS's three WWTPs. MWS's permitted non-domestic sewer users include:

Significant industrial users (SIUs)	69
Categorical industrial users (CIUs)	41
Non-categorical SIUs	28
Non-significant industrial users	78
Total permitted industrial users	147

The IPP staff includes three full time employees with an average of 18 years experience in pretreatment. The Pretreatment Manager has more than 27 years of experience in pretreatment. Two additional staff members are trained to assist in sampling when needed. The IPP staff is part of the Environmental Compliance Section within the Operations Division of MWS.

The IPP staff performs an official inspection of all SIUs at least annually. Many receive a walk-through inspection during sampling events or meetings also. At least twice a year, sampling is performed for a minimum of three consecutive days, but typically for five consecutive days, at the SIUs.

MWS currently has ten satellite municipalities that discharge into their WWTPs. There are three total SIUs in two of the municipalities. Tyson is located in the City of Goodlettsville; Specprint and Viking Products are located in the City of Mt. Juliet.

The Environmental Compliance Section and System Services Division personnel communicate with each other regarding potential sewer line damage, blockages and other interference problems related to industrial and commercial dischargers. The information that is shared includes notification of food service establishments (FSE) and fats, oils, and grease (FOG) interferences identified during FSE inspections.

The FSE inspections are conducted by MWS's FOG program contractor, Monitoring and Management Services, LLC, and by the Environmental Compliance Section staff. A request is made to the System Services Division for sewer line cleaning when FOG is identified as causing obstruction or interference to the sewer system. FSEs identified as contributing to FOG are issued a noncompliance notification that requires a corrective action response. The System Services Division provides FOG-related sewer maintenance work order information to the Environmental Compliance Section. This information initiates follow-up inspections of the area where the obstruction or interference was identified by the FOG contractor to identify FOG

dischargers. Responses are also made to SSO events that are caused by obstruction. However, the main objective of the MWS preventive measures with FSE inspections and communication with the System Services Division is to prevent any FOG related SSO (See Operation Program, Section IV. Fats, Oils, and Grease Control Program for more details).

When the Environmental Compliance Section sampling and analysis results indicate that a non-domestic sewer user's discharge may be causing damage to the collection system, the System Services Division is notified. Based on the sampling analysis, the System Services Division televises the sewer line and provides information about any damage identified. In turn, when the System Services Division scheduled sewer maintenance and televising of the sewer lines reveals sewer line damage, the Environmental Compliance Section responds to identify the source.

The information in Table 4 was derived from the files of the MWS's IPP and State Reports 36 and 37 (April, 2004 - March, 2005). The industrial flow percentages were calculated using the average flow for dry weather months (June, July, and August) for each treatment plant in 2004.

**Table 5-1. Industrial Flow Percentages during Dry Weather Months**

WWTP	Central	Whites Creek	Dry Creek
WWTP Average capacity	125 MGD	37.5 MGD	24 MGD
Total industrial flow	3.08%	2.19%	5.66%
Categorical industries	0.36%	0.07%	0.32%
Surcharge industries*	2.12%	1.20%	0.64%
Compatible industries**	0.60%	0.93%	4.70%

\* Industries whose discharge is excess strength.

\*\* Industries whose discharge has compatible parameters but not at a level that is surchargeable.

### III. Corrosion Control Program

#### History

MWS's Odor and Corrosion Control Program began in the early 1980's as a result of the catastrophic failure of relatively new gravity interceptors fed by sewage pump stations through long force mains. In the mid 1970's, Public Law 92-500 required the removal of heavy metals from industrial discharges which increased the production of hydrogen sulfide (H<sub>2</sub>S) in sewer lines. As the projects in MWS's OAP program removed increasing amounts of I/I, the detention time increased in force mains, increasing the production of H<sub>2</sub>S. Previously accepted engineering designs, such as

drop manholes, freely liberated the H<sub>2</sub>S from liquid phase into gaseous phase, resulting in H<sub>2</sub>S corroding the crowns and walls of the infrastructure.

MWS used a product called Odophous, an iron salt, for approximately ten years. Odophous was a benign product but had a pH of less than 2.0, making it a placarded commodity and regulated under the UST regulations. These regulations forced MWS to change to a new product, Bioxide, a nitrate salt solution. Bioxide was used from the early 1990's until 2002 when MWS began using a product called Nitrazime, another nitrate solution. With that change MWS received better vendor support in the application and management of the chemical feed systems.

The Odor and Corrosion Control Program was originally the responsibility of the Operations Division. In the mid 1990's, this responsibility was transferred to the System Services Division. In 2000, when CCTV revealed more aggressive system corrosion, the Engineering Division assumed the duty of odor and corrosion control. The Engineering Division acts as a consultant to both the Operations and System Services Divisions to solve odor and corrosion control problems. Funding for the chemicals used is part of the Route Services budget of operations.

### **Methodology**

MWS feeds Nitrazime at 19 sewage pump stations within the collection system. Except for any unusual or special circumstances, chemicals are not fed into the gravity or combined portion of the system.

Each site is visited at least weekly by the chemical vendor. Additional monitoring of each site is conducted by the engineering staff. The vendor submits a weekly report to the Engineering Division office that includes the H<sub>2</sub>S readings, feed rates, and gallons chemical received that week and over the past year. This information is verified by the staff to ensure its accuracy and then filed electronically for future reference.

The engineering staff monitors customer complaints, new plans submittals, work orders, news stories, and political comments for problem areas, signs of infrastructure damage, and opportunities to affect positive change. Chemical feed sites are selected based on these issues. Suspected problem areas are sampled in the wastewater and headspace for H<sub>2</sub>S for several days to several weeks and a decision is made on corrective action.

Odor complaints are received from direct customer complaints, personal contacts, the political arena, and previous contacts and are entered into the CMMS to allow work orders to be generated to ensure an investigation is made to determine the cause of the odor problem.

The Industrial Compliance Group is notified of corrosion problems that are noted during any sewer assessment work that is suspected to be related to discharge from an industrial customer.



### **Satellite Municipalities and Utility Districts**

The Engineering Division works with the Environmental Compliance Section to enforce ordinance limits on the satellite municipalities and utility districts that discharge to the MWS system. Satellite systems must meet a H<sub>2</sub>S limit of 0.5 mg/L in the liquid. At MWS sampling points, a H<sub>2</sub>S goal of less than 0.1 mg/L in the liquid and 1.0 mg/L in the air has been set by the Engineering Division. The 0.5 mg/L H<sub>2</sub>S limit was developed after years of data was reviewed. This was determined to be a practical limit that the MWS systems could economically achieve and still have years of engineering life left in the infrastructure.

## **IV. Fats, Oils, and Grease Control Program**

In the Fall of 2000, MWS began researching the magnitude and scope of fats, oils and grease in the collection system. A fats, oils and grease (FOG) Control Program was initiated in April 2003 with the goal of reducing FOG discharges and eliminating FOG-related SSOs. At that time, MWS contracted with Monitoring & Management Services, LLC (MMS) to assist in implementing and maintaining the FOG program. The major elements of MWS's FOG program are described below.

1. Education of food service establishments, grease waste haulers, plumbers, institutional managers, and engineers on prevention of FOG discharges including review of proper installation and maintenance of grease interceptors and grease traps and review of FOG prevention best management practices.
2. Consistent, thorough inspections of food service establishments (FSE). These inspections include providing and reviewing MWS's customized FOG brochure with the FSE owner, educating the FSE owner regarding best management practices and grease control equipment maintenance practices, conducting a visual inspection of the three manholes downstream of the FSE, documenting grease control equipment and downstream manholes with a digital camera, and identifying any storm water pollution impacts. If necessary, MWS issues noncompliance notifications to FSEs that are discharging FOG, have inadequate grease interceptor or grease trap components or maintenance, or have other deficiencies that will impact the MWS sanitary sewer or stormwater sewer system.
3. Issuing FOG permits to FSEs. The purpose is to increase awareness that FOG control is a serious issue and that the FSE must comply with MWS's sewer use ordinance requirements for non-domestic sewer users. The current total FSEs with FOG permits is 1,750. Included in the FOG permit is a requirement that all FSEs with grease control equipment (GCE) must submit an annual certification that the GCE is operating according to the manufacturer's specifications. More than 40 FSEs that had defective grease interceptors have been identified through this process.
4. Certification of grease interceptors and grease traps is an annual requirement of the FSE's FOG permit and provides a means to identify leaking or defective equipment that must be replaced. MWS established a Grease Interceptor and Grease

Trap Certification Program in July 2005. MWS has demonstrated that education and testing of grease waste haulers, plumbers and engineers to be able to properly conduct grease control equipment certifications can provide tremendous benefits. Grease waste haulers, plumbers, and engineers attend a training class and are tested to be qualified to conduct certifications on grease interceptors and grease traps. The training classes have been conducted quarterly in the past but will begin to be offered semi-annually after September 2006. When an inspector passes the required test following the class, he receives a card indicating he is qualified to conduct inspections of GCE. The qualification card is valid for 2 years.

5. FOG Database for FSE tracking. MMS developed a database referred to as SOFT (Sewer Maintenance, Overflows, FOG Tracking) for MWS. Over 2,200 facilities have been entered into the SOFT database; 1,750 FSEs are permitted. The SOFT database allows for inspection and enforcement tracking of FSEs and includes the ability to load/download pictures, issue FOG permits, and develop customized reports. Currently, MMS is working to convert the Access 2003 based SOFT database to a web-based database. The web-based database will provide a more convenient exchange of information within the department and provide information in real-time for all MWS staff to reference. MMS recently began beta testing the web-based SOFT database.

6. Sewer Maintenance and SSO response to FOG-related problems. As mentioned in **Operation Program, Section II. Pretreatment Program**, communication with the Environmental Compliance Section and System Services Division is critical to be able to identify the specific cause of the SSO and provide the appropriate response as quickly as possible. Enforcement of FOG regulations and targeted cleaning as a result of this communication has been successful in preventing many FOG-related SSOs. Since the initiation of MWS's FOG Program, MMS has prepared 63 special reports regarding FOG "hotspot" areas, responses to sewer maintenance issues and FOG-related SSOs. The number of special reports does not include the numerous email and phone call correspondences that have been initiated for other "high FOG risk" FSEs and for the installation of new grease interceptors.

7. Residential FOG. In some areas, residential sewer users discharge FOG to the sewer system which could cause an obstruction and/or a SSO event. MWS produced a 10 minute FOG educational video that is shown on the community access channel and at various meetings with FSE managers. Also, the System Services Division distributes door hangers to residences in the areas where residential FOG is identified in the sewer system. Inserts have been included with residential customers' monthly sewer bills to inform them of FOG best management practices that will help to prevent FOG discharges from their residence. In addition, MWS plans to initiate a mailing system that will distribute a notification to all residential customers in a specific area where FOG interference has been a problem.

8. Performance Indicators. MWS tracks the number of FSE inspections and FSE FOG permits issued, noncompliance notifications, notices of violation, new grease

interceptor installations, SSO events related to FOG, sewer maintenance costs, and FOG volume pumped from FSEs. These performance indicators demonstrate that the MWS FOG Program is headed in the right direction. The number of SSO events related to FOG has decreased from 46 events in 2003, to 21 events in 2004, and further to 12 events in 2005. There have been 3,983 FSE FOG inspections since 2003.

The MWS' Central WWTP receives and treats FOG waste. There are also private facilities that receive and treat FOG waste. All grease waste hauler FOG volume pumped from FSEs is tracked each month. Table 5 is a summary of the FOG volume pumped from FSEs in MWS's jurisdiction.

**Table 5-2. FOG Volume from FSEs in MWSs Jurisdiction**

	<b>Central WWTP FOG</b>	<b>Total FOG (Private Facilities and Central WWTP)</b>
<b>Prior to FOG Program (March 2002-Feb 2003)</b>	71,430 gallons per month	182,270 gallons per month
<b>After FOG Program (Nov 2005-April 2006)</b>	155,132 gallons per month	305,997 gallons per month
<b>Increase of</b>	117 %	68 %

Since the initiation of the MWS' FOG Program, 578 FSEs have been issued noncompliance notifications for 985 deficiencies. The noncompliance notification deficiencies include:

1. Grease Interceptor (GI) effluent tee not attached or not acceptable
2. GI effluent tee not visible or accessible creating a FOG discharge potential
3. GI walls indicate deterioration
4. GI FOG layer and food solids layer estimated at >25%
5. FOG in downstream manhole from FSE
6. FSE has no GCE installed
7. No records of GI or trap maintenance
8. Sewer cleanout covers need to be replaced
9. FOG on ground/storm water impact

Appendix N includes the following detailed information regarding the MWS's FOG program:

- Example FOG Permit
- Noncompliance notification form
- Grease interceptor certification form
- Grease trap certification form
- Example special FOG Report
- FOG database example
- FOG pump volume graphs
- Environmental compliance website
- MWS fats, oils, and grease management policy
- Food service establishment enforcement response guide

### **Recommendation**

MWS will complete the implementation of a mailing system to distribute a notification to all residential customers in a specific area where FOG interference has been a problem. An English/Spanish notification is being developed. The notification will be ready for implementation in February 2007.

## **V. Service Connection/Disconnection Program**

MWS has a written procedure for new service connections and for service disconnections. The procedure for tapping into the collection system is outlined in "Guide to New Construction," available on the website:

[http://www.nashville.gov/water/permits\\_handbooks.htm](http://www.nashville.gov/water/permits_handbooks.htm). MWS will perform the tap or a licensed municipal utility contractor or licensed master plumber may follow the "Tap Policy" as described in the guide. MWS also has standard requirements and construction details available on their website:

<http://www.nashville.gov/water/technicalspecifications.htm>.

After the installation of a new service connection, MWS performs a pressure test on the service line and main. As-built plans for the new connection must be submitted to MWS in digital and hard copy form so that the new service line may be added to the GIS mapping program.

## **Recommendation**

MWS will review the current procedures for new service connection and for service disconnections to determine if the procedures need to be updated. This review will be completed by May 2007.

## **VI. Private Haulers Program**

In 1989 and 1995, MWS collected numerous samples from each truck hauling waste from septic tanks, FOGs, and portable toilets to determine BOD<sub>5</sub>, TSS, FOG, and metals loading to the WWTP. To develop the fee structure for waste haulers, random samples were collected and screened for pH, metals, BOD<sub>5</sub>, TSS, and FOG. The results of the hauled waste sample program are provided in Appendix O.

Currently, MWS's Environmental Compliance Section inspects and permits septic tanks, portable toilet, and FOG waste haulers. Septic tanks, portable toilet wastes, and FOGs are the only hauled wastes accepted for treatment. Central WWTP has a designated receiving station and is the only MWS WWTP that accepts hauled waste. The Environmental Compliance Section personnel inspect the hauled waste vehicle and issue a permit to the waste hauler to discharge to the Central WWTP.

The manifests and "dump tickets" are collected by security and reviewed by Environmental Compliance Section personnel. The data is logged and maintained for operational and predictive trending. In addition, FOG waste haulers are routinely audited to review manifests and invoices and to compare volume records with FSEs they service. Upon completion of the Biosolids facility that is currently under construction, grease waste haulers will use an automated system to log in, discharge restaurant grease waste that is metered, and pay by monthly invoice.

## **VII. Line Location Program**

MWS is a member of the Tennessee One-Call (TOC) system which includes all underground utilities ([www.tnonecall.com](http://www.tnonecall.com)). In accordance with State statute, persons performing any excavation in public areas are to contact the Tennessee One Call agency. MWS complies with Chapter 31, "Underground Utility Damage Prevention Act," of Tennessee state law as it relates to the demarcation of underground public infrastructure. For the collection system, infrastructure includes all public sewer mains.

MWS currently performs all field locates in-house with a staff of eight locating/planning teams. Each crew has a laptop to receive all TOC requests. Annually MWS responds to approximately 42,000 Tennessee One-Call tickets. Of those, approximately 10,000 result in physical marking in the field. Daily emergency locates are dispatched through the call center. All tickets must be evaluated for type of response and communicated back to the Tennessee One-Call call center. Routine marking requests are processed within three days of receipt; emergency requests within two hours. In the last several years, MWS has successfully responded to all such requests within the prescribed response time.

Site visits are performed by MWS during and after excavation to ensure no damage was sustained to the sewer system infrastructure. Hard-copy documentation of requests and responses are maintained for five years.

## **Section 6. Maintenance Program**

### **I. Pump Station Preventative Maintenance**

#### **a. Pump Station Repair Program**

All equipment repairs, predictive maintenance checks, electrical preventative maintenance activities, and mechanical preventative maintenance work for MWS pump stations are logged into the CMMS to allow all work performed on the pump station equipment to be tracked.

These repairs are entered into the CMMS in one of three ways: upon completion of the work by Route Services Section personnel (work found and corrected in the same station visit), as a service request (SR) generated as part of the performance of weekly inspections, or as a SR issued due to a SCADA system alarm. Once a SR is entered into the maintenance system, a Route Services Section supervisor generates a work order for the defective equipment. Repair work orders are entered in the CMMS as top priority and take precedence over weekly preventative maintenance work orders.

The Route Services Section currently has six crews in designated pump station maintenance zones that are responsible for making the necessary repairs and performing maintenance based on work orders. These crews are made up of two mechanics and one electrician. These crews are also responsible for the repair and maintenance of approximately 400 residential grinder pumps that are maintained by MWS.

Operation and maintenance (O&M) manuals for equipment are located in the Route Services Section office complex. These manuals allow the maintenance crews to review information to accurately order replacement parts, review electrical line diagrams, and locate other essential information needed to perform repairs. Most O&M manuals contain warranty information; however the CMMS is updated with the most recent warranty information based on recent equipment refurbishments or replacements.

For equipment no longer under warranty, maintenance crews perform most minor mechanical repairs which are within the capabilities of MWS personnel. Most of the large equipment is repaired under contract with local vendors. This work typically includes rebuilding pumps, rewinding motors, and HVAC repair. Repairs to motor control centers, flow meters, remote monitoring equipment, and valves are typically repaired by MWS maintenance crews.

Some equipment parts have a long lead time or have been determined as critical to the operation of a pump station. These parts are kept at the Route Services warehouses. Parts that are readily available are obtained through local vendors or at the equipment manufacturer's local service center. Spare pumps are also kept on-hand for several of the smaller stations. It has proven to be cost-effective to replace this equipment versus making equipment repairs.

Repairs are logged into the CMMS under the appropriate pump station asset ID. This procedure allows the maintenance supervisor to track the service life of pump station equipment to determine if repairing or replacing the equipment is the most cost effective solution.

### **b. Electrical Preventative Maintenance Program**

As previously discussed, work performed at a pump station is logged into the CMMS, including the weekly electrical preventative maintenance (PM). The CMMS automatically generates work orders for weekly electrical PM actions. These work orders are considered "open" until maintenance crews perform the work order.

The Maintenance Division has six electricians responsible for performing electrical PM at pump stations.

A copy of the Route Service PM Activities for Electrical Components is in Appendix P.

### **c. Mechanical Preventative Maintenance Program**

As previously discussed, work performed at a pump station is logged into the CMMS system, including the weekly mechanical PM. The CMMS automatically generates work orders for weekly required PM actions. These work orders are considered "open" until maintenance crews perform the work order.

The Maintenance Division has 12 industrial mechanics responsible for performing mechanical PM on pump stations.

A copy of the Route Services Mechanical PM for Sewer Pumping Stations is in Appendix Q.

### **d. Physical Maintenance Program**

The Route Services Section of the Operations Division is responsible for the physical maintenance of pump stations. Each Route Services Section crew is responsible for performing the following tasks for all stations located in their maintenance zone:

- General housekeeping and cleanliness
- Inspect safety equipment (handrails, signs, hoist, etc.)
- Inspect security components (doors, fencing, etc.)
- Inspect HVAC filter for replacement
- Wash down equipment (hose bibs, hoses)

Grass cutting is currently outsourced as part of a contract maintained by the Safety and Security Section of the Operations Division. Roof repair and facility painting are



addressed by the Real Property Division of Metro. These activities are coordinated through MWS by the Administrative Services Officer in the Engineering Division. Not all of these tasks are logged and tracked in the CMMS. Tasks undertaken by the Route Services Section crews are covered under the performance of weekly PM duties and are logged into the system. Work performed by the grass cutting contractor and Real Property Services is not tracked in CMMS.

All of the above preventative maintenance performed on pump stations is periodically checked to ensure weekly and bi-annual maintenance is being performed adequately. These periodic checks are performed by the Maintenance Supervisor and the Manager of Route Services.

## **II. Gravity Line Preventative Maintenance**

Sewer maintenance personnel in the System Services Division include six cleaning crews, five CCTV (televising) crews, one combined sewer overflow (CSO)/regulator crew, and one crew for trunk line inspection and manhole maintenance. These crews are managed by the Industrial Maintenance Supervisor. The night and weekend crews both consist of a sewer maintenance crew and water and sewer repair crews. Other day crews include repair crews and crews responsible for planning and locating water and sewer facilities, investigating sewer complaints, and investigating leaks.

### **a. Routine Hydraulic Cleaning and CCTV Program**

CCTV crews record the condition of a sewer after a sewer line blockage is cleared, when a service locate is needed, during wet-weather events to detect leaks and identify segments for lining or point repairs, to identify candidates for rehabilitation, and for general television work. CCTV crews also assist with the identification of causes of sewer overflows or restrictions. The cleaning and CCTV crews assist each other as needed.

Jet cleaning equipment is used to clean the majority of the sewer lines. The standard attachment used is a spinning jet nozzle. Root saws are stocked on each truck and are easily attached to the jetting equipment and used on an as-needed basis.

Field Equipment used for cleaning sewer lines includes:

- 4 Combination jet/Vactor trucks
- 3 Jet trucks
- 5 CCTV (televising) units
- 3 large diameter sewer cameras
- 1 easement unit

Maintenance crews are assigned according to several regular work schedules that provide coverage 7 days per week; 19 hours per day on Monday through Friday and 13 hours per day on Saturday and Sunday. As discussed in **Management Program, Section IX.a. Complaint Management Program**, personnel are also on a rotation "on-call" list to provide emergency 24 hour coverage.

Records are logged in the CMMS that track date, time, and location of routine cleaning activities, specific lines cleaned, equipment used, identity of cleaning crew, number of passes needed to clean the line, presence of root, grease, or debris problems, any problems or other actions necessary, and pertinent asset information such as size, material, length, and manhole status. Each crew submits a log for each day of work completed which is then verified for accuracy by office personnel and entered into the CMMS. An example of a CCTV inspection log can be found in Appendix R. CCTV logs are also scanned into the system.

Crew assignments are by geographical area in specific zones. Generally, crews clean and do television inspection of their entire geographical area and then repeat the cleaning and televising cycle with the exception of areas determined to be a problem for grease or roots. These problem areas may require more frequent cleaning visits.

Goals for cleaning crews and CCTV crews are set and progress is monitored by the Sewer Maintenance Supervisor and Manager. There are 2,676 miles or 14,129,280 feet of separate sanitary sewers and 224 miles of combined system.

#### **Sewer Cleaning Goals and Performance**

Each cleaning crew has a goal to clean 40,000 feet per month and 2,000 feet per day of sanitary sewers. These goals were met in fiscal years 2005 and 2006 and are shown in Table 1 below. With six crews, the average for each crew was 41,719 feet per month and 2,085 per day for 20 work days per month.

Some line segments may require more than one pass to complete the cleaning. Multiple cleaning of a line segment is counted toward daily or monthly goals to reflect the effort required. Actual footage of sewers cleaned has not been tracked in the past.

#### **Recommendation**

MWS will develop a method to track the actual footage cleaned from manhole to manhole that does not include footage from multiple passes. This will provide a more accurate measure of the actual footage of the system being cleaned each year. The implementation deadline for this recommendation is October 2007.

MWS will develop goals of the actual footage to be cleaned that reflect an analysis of past CMMS cleaning data to determine the actual footage of sewers cleaned by November 2007.

MWS will evaluate daily goals based on 210 working days per year or 17.5 days/month, which includes estimates for the many reasons crew members would not be available. Goals will be reviewed to reflect potential improvements in planning, scheduling and record keeping, along with fundamentals of continuous improvement. Also, goals will consider that there are certain segments that require more frequent cleaning. Evaluation of the goals will be established by January 2008.

**Table 6-1: Sewer Cleaning Performance Goals**

<b>Sewer Cleaning (LF)</b>	<b>Current Goals</b>	<b>FY 2005 Actual</b>	<b>FY 2006 Actual</b>	<b>FY 2008 Goals including Multiple Runs</b>	<b>FY 2008 Goals of Actual Feet</b>
Sewer cleaned per year	2,880,000	2,675,996	3,003,827	TBD	TBD
% sanitary sewers cleaned	20.4%	18.9%	21.3%	TBD	TBD
Sewer cleaned/month/crew (with 6 crews)	40,000	37,166	41,719	TBD	TBD
Sewer cleaned/day/crew (with 6 crews) @20 days/mo.	2,000	1,858	2,085	TBD	TBD
Sewer cleaned/day/crew (with 6 crews) @17.5days/mo.	Not established	2,124	2,383	TBD	TBD

#### **Sewer Televising Goals and Performance**

The CCTV crews have goals to complete television inspection of 30,000 feet per month and 1,500 feet per day of sanitary sewers. These goals were met in fiscal years 2005 and 2006 are shown in Table 2 below. With five crews, the average for each crew was 31,742 feet per month and 1,587 per day for 20 work days per month.

## Recommendation

MWS will evaluate ways to set priority on how often various groupings of sewer categories should be inspected with television. Examples, new PVC or recently lined sewers may not be inspected for another 5 to 10 years. However, clay or sewers older than 20 years or large diameter brick sewers would have priority to inspect them within the next five years. This evaluation will be completed by December 2007.

MWS will purchase software for TV units that will allow priorities to be entered into the CMMS. This enhancement process will be in operation by June 2007.

MWS has recently purchased three new CCTV cameras to inspect and to televise the 224 miles of CSO lines and the other large diameter sewers. Three crews began using the cameras in August 2006. As experience is gained and the process refined of using these cameras, MWS will develop a plan and standard operating procedures (SOP) to inspect a certain amount of large diameter sewers over a projected period of time by January 2008.

The CSO and large diameter sewer televising will be incorporated into the goals for sewer televising for the entire system.

**Table 2: Sewer Televising Performance Goals**

Sewer Televising (LF)	Current Goals	FY 2005 Actual	FY 2006 Actual	FY 2008 Goals
Sewer TVed per year	1,800,000	2,063,619	1,904,574	TBD
% sanitary sewers TVed	12.7%	14.6%	13.5%	TBD
Sewer TVed/month/crew (with 5 crews)	30,000	34,393	31,742	TBD
sewer TVed/day/crew (with 5 crews) @20 days/mo.	1,500	1,719	1,587	TBD
Sewer TVed /day/crew (with 5 crews) @ 17.5 days/mo.	Not established	1,965	1,814	TBD

## b. Root Control Program

The current method of root control is mechanical removal and pipeline rehabilitation. Each cleaning crew carries root saw attachments on their trucks. When a crew encounters roots during routine cleaning, they attach a saw and cut through and remove the roots. The severity of the problem is recorded on the daily log. These

areas are also televised to determine the defects that are allowing root intrusion. In most cases, roots enter the main line through service laterals, although there are cases where the main line is the source of a root problem. Lines determined to be in need of corrective action are evaluated to determine if replacement or lining (**Management Program, Section V.g. Infrastructure Rehabilitation Program (Overflow Abatement Program, OAP)**) is the best option.

Chemical root control programs have been evaluated in the past and were not deemed to be advantageous over the mechanical removal and pipeline rehabilitation efforts.

### **Recommendation**

MWS will consider development of a policy for resolving root intrusion in service lines with a customer by October 2007.

### **c. Manhole Preventative Maintenance Program**

Manhole conditions are a part of the inspection by cleaning crews, the manhole and trunk line inspection crew, and a contract manhole crew. As routine cleaning is performed, the cleaning crews observe and note any manhole deficiencies on their cleaning logs. When a basin is targeted for rehabilitation, the manhole crew or the contract crew inspects each manhole in the basin and recommends repairs. The resulting information is used to develop work orders for the manhole rehabilitation crew, to correct or to assign to a contract manhole rehabilitation crew, or to include in a rehabilitation project with point repairs and lining of the sewers. The contract manhole crew is employed to perform rehabilitation of manhole cones and risers when needed.

The repair crews are responsible for structural repairs to manholes. Repairs include frame and cover grade adjustment, frame and cover replacement, and invert reconditioning. As noted in **Management Program, Section VIII.a. Spare Parts, Tools and Equipment Inventory Program**, MWS maintains an inventory of frame and covers to facilitate these repairs. A cementitious grout or epoxy is applied to the inside of manholes; chemical grout is used to stop specific leaks.

Work orders are created and entered into the CMMS and repairs are made based on the OAP priority matrix or as decided by the Sewer Maintenance Supervisor.

## **III. Air Valve Preventative Maintenance Program**

Air/vacuum valves on sewer force mains are in the process of being checked and maintained or replaced on an annual basis. Replacement units are of the latest model and material for long-term reliability. MWS is performing a portion of these checks and is also pursuing contract services for the remaining valves to be accomplished within a year of assignment. There are approximately 500 such valves in the system.

An inspection program on all valves is being established. As-builts are being obtained to allow each valve to be added to CMMS as an asset.

## **Recommendation**

MWS will develop standard operating procedures for inspection and replacement of air/vacuum valves by December 2007.

## **IV. Maintenance of Rights-of-Way**

### **a. Maintenance of Rights-of-Way and Easements Program**

It is estimated that 90% of the easements in which sewers are located are on record. All easements acquired since the early 1980's are easily accessible; for projects from the mid-1960's to the early 1980's, approximately 90% of the easement documents are easily accessible; for projects prior to the mid-1960's, 50% of the documents can be located without extensive research.

MWS recognizes the need to have access to their assets within easements. While MWS does not have an active surface easement maintenance program, access is provided on an as-need basis.

### **b. Property Rights Protection Program**

Property rights are necessary for the installation, operation, and maintenance of all MWS facilities. Records of property rights for MWS facilities are maintained to assist in the review and evaluation of proposed work that might impact MWS's ability to access, operate, and maintain existing facilities.

Property rights may exist in several different forms. For example, sewer lines may be installed in public rights-of-way, where the right-of-way itself provides an easement or in easements obtained and recorded from privately held property, in which case there will be a document recording the easement either on a property or subdivision plat or a unique easement document. The easement may be specific for only water, wastewater, storm water and drainage, or access purposes, or it may allow for all utility purposes. The property rights for facilities may also exist "in fee simple," meaning that the actual property ownership has been acquired in the name of MWS or the Metropolitan Government for public purposes.

Property rights for MWS's facilities are made permanent public records by being recorded in the Registrar of Deeds Office, either in Davidson County or in other counties when property in MWS's service area is located outside the boundary of the Metropolitan Government. Property rights that have been obtained in recent years are readily available for inspection in the offices of the Registrar or in the case of Davidson County and some other counties, via the internet. Older documents dating from the 1800's up to the late 1950's are also available at these locations; however, research is often required to determine the actual purpose of the document of record.

Requests for encroachment upon MWS's property rights may include street and alley closures, property redevelopment plans, and requests from individual property owners. In each situation, the location and nature of MWS's facilities, both existing and planned, are compared with the requested encroachment. The approval or denial

of the request is dependant on the impact of the proposed encroachment, the nature of the facility, and options available to those making the request.

- If the encroachment is of a minor nature and will not significantly reduce MWS's ability to operate and maintain the facility, a letter of encroachment will be granted to the property owner. This letter, which is recorded in the Registrar of Deeds office, confirms MWS's agreement to allow the minor encroachment.
- Encroachments of a serious nature which significantly impact MWS's ability to operate and maintain existing facilities or construct planned facilities are denied, unless the requesting property owner agrees to pay for relocation of the facility and related property rights in order to eliminate the conflict.
- Encroachments of a serious nature which may impact MWS's ability to operate and maintain the facility may be allowed with the execution and recording of an Exception to Easement agreement. This document specifically states additional obligations to be assumed by the property owner in exchange for approval by MWS, relieving MWS of risk for property damage that might be incurred should the facility require maintenance activities which will damage the approved improvements within the area where MWS holds property rights. These agreements are considered actions of last resort and are used where no reasonable alternative solution exists and the property owner is willing to accept the significant risks associated with executing their planned improvements.

Existing encroachments to the property rights of MWS may be discovered in the course of normal operation and maintenance of the MWS system. In such situations MWS will pursue correction of the encroachment in a manner similar to that outlined above. In addition, there are situations where existing encroachments were approved or allowable by the rules of operation of utility districts which have been acquired by the Metropolitan Government. In these situations the conditions under which the encroachment was initially allowed is taken into account when determining the resolution of the property rights issue.

Documentation of MWS's property rights is maintained in the Engineering Tracking System under project number for the facility for which the property rights were required and maintained. Documents which approve encroachments are also recorded in the Engineering Tracking System and the appropriate Registrar's office.

### **c. Street Paving Monitoring Program**

#### **Casting Adjustments**

The Casting Adjustments Unit has the responsibility of removing all existing manholes, valve boxes, curb inlets and area drain castings prior to any asphalt milling on roadways. It is also the responsibility of the Castings Adjustment Unit to remove all broken and damaged castings and to place existing or replacement castings at the new roadway elevation before any asphalt is placed.

### **Patch Paving**

The Patch Paving Unit has the responsibility of restoring existing public streets, alleyways, State highways and roadways to a safe condition that meet State and local paving specifications. The Patch Paving Unit acts in a timely manner to correct or rebuild the portion of roadway that was removed due to a sewer repair or water repair.

## **V. Reactive Maintenance Program**

All work is tracked in the CMMS by various qualifiers (preventive maintenance, repair, asset, location, staff, etc). Preventative maintenance constitutes approximately 98% of work effort in the collection system. Reactive maintenance is performed when defects are discovered during the televising of sewers to eliminate potential system failure and in response to emergency calls related to sewer issues or a possible sewer main break. The emergency calls are answered by the MWS Dispatch. When the call is received, a service request is entered into the CMMS and the request is sent to the System Services Division for action. Any reactive maintenance or repair work performed is documented and entered into CMMS. This information, as well as other CMMS documented activity, is used for reporting, planning, and resource allocation. It is also used by Metro Legal in the investigation of claims.



# **Section 7. Combined Sewer Overflow Program**

## **I. Nine Minimum Controls**

On June 28 and 29, 2006, a presentation was given at MWS's offices to EPA representatives on the Nine Minimum Controls. Plans are in place that address each control area and MWS staff has been assigned to specific tasks.

A digital copy of the presentation that was presented to EPA is provided in Appendix S.

## **II. Long-term Control Plan**

In March 2002, a draft of the Long Term Control Plan was completed. In May 2005, MWS submitted a revision to the plan to TDEC for review and approval. This plan was developed as a result of EPA's "Combined Sewer Overflow Control Policy" that was established in 1997. This policy required operators of wastewater systems with CSSs to meet the established nine minimum controls. A copy of MWS's draft plan was also submitted to Region 4 EPA in April 2006 as requested in a 308 Request for Information letter. The goal of the plan is to protect water quality through system enhancements to mitigate CSO events.

MWS has prepared several reports over the years that discussed the detailed analysis of several alternative solutions to address CSOs. As recommended solutions were identified for an individual basin, further study was performed. Since the initial plan was developed, there has been minimal exploration into additional alternative solutions.

Prohibitive costs restrict the ability to eliminate the CSOs quickly, therefore defined projects and schedules to achieve the goal in a reasonable timeframe were established. The present schedule of proposed capital improvements for both the SSS and CSS is typically within a range of 20 to 25 million dollars per year. The financing of the work to date has been by two revenue bond issues, which required water and sewer rate increases.

Table 7-1 summarizes the progress that has been made by MWS in resolving the CSO/SSO problems in the sewer system.

**Table 7-1. CSO/SSO Progress from 1990 to 2005**

	1990	2005
<b>Number of CSO locations</b>	30	9
<b>Number of SSO locations</b>	157	55
<b>CSO volume (MG)</b>	10,079 (1989)	1,015
<b>Number of SSO events</b>	512	Rainfall Induced - 263 Power Out - 12 Mechanical - 32 Maintenance - 76 <b>Total - 383</b>
<b>Pump Station overflow volume (MG)</b>	1,355	35
<b>Cumulative Annual I/I removed (MG)</b>	0	~3,000 (2003)*

\*Analysis of cumulative annual I/I ceased in 2003.

Of the nine remaining CSO's, two have received correction action to prevent overflows from occurring for a statistical eight times per year from rain events. In addition, two of the remaining CSO's are to provide emergency storm water relief points for downtown Nashville and are designed to overflow only during 10-year rainfall events. Projects for the remaining sites have been identified and an implementation schedule developed. Table 7-2 provides details of those projects.

**Table 7-2. Schedule of Future CSO Projects**

<b>Location</b>	<b>Design Date</b>	<b>Construction Date</b>	<b>Estimated Capital (in million dollars)</b>
Benedict and Crutcher	2009	2010	\$9
Kerrigan	2013	2014	\$1 - \$10
Schrader Lane	2012	2013	\$10
Washington DC	2006	2007	\$19
Village Court	2006	2007	\$1.5

Additional detail of the projects for each location can be found in the Long Term Control Plan.

## **Recommendation**

MWS will update the Long Term Control Plan on an as needed basis.

## **III. Wet Weather Treatment Plant Capacity**

MWS has developed wet weather flow management plans for each of the WWTPs in the system. It is the policy of each plant to treat the highest rate of flow possible during wet weather events to minimize overflows from the SSS and in the case of the Central WWTP, from the CSS.

The plans for each WWTP are summarized below.

### **Central WWTP**

The Central WWTP serves both the separated and combined sewer systems. Before placing the Excess Flow Treatment Unit (EFTU) in service, the capacity of the available secondary treatment units must be maximized.

The Central WWTP was designed with the following parameters:

A. Average Design Flow	125 MGD
B. Peak Design Secondary Flow	250 MGD
C. Peak Design EFTU Flow	80 MGD
D. Peak Hydraulic Flow	330 MGD

For extreme wet weather events, the Central plant should expect as much as 187.5 MGD from the separate sewer system as follows:

Browns Creek Pump Station	140 MGD
Shelby Park Pump Station	15 MGD
Cowan Street Pump Station	12.5 MGD
28 <sup>th</sup> Avenue Pump Station	<u>20 MGD</u>
Total	187.5 MGD

Flow from then combined sewer system enters the Central plant through the Central Pumping Station (CPS), rated at a firm capacity of 160 MGD.

During rainfall events flow from the combined sewer system will begin to raise the water level in the wet well of the CPS. From the time the wet well rises from the normal level of 17 feet until the level approaches the overflow level of 44 feet, the plant determines what additional treatment units, if any, should be placed into service to maximize flow through the plant. Use of meteorological data from various internet sites has proven to be useful in forecasting whether or not sufficient flow will be received to necessitate use of the EFTU. In general, hydraulic modeling has indicated that the collection system may be capable of receiving runoff from a storm event with a recurrence interval of 12 times per year without overflowing at the Kerrigan CSO. This statistical rainfall event corresponds to just over 1 inch in 24 hours, and a one hour maximum intensity of 0.4 inches per hour. If at all possible,

plant flow through secondary treatment units should be maximized and the EFTU should be placed into service before the CPS wet well level reaches overflow elevation.

As the influent flow rate increases during wet weather events the operator needs to insure sufficient units are on-line and in service.

In an effort to meet the capacity of the treatment units of the plant and treat the highest rate of flow possible during wet weather, operations personnel have developed an excess flow standard operating procedure, based on experience and data from past storm (excessive flow) events. This SOP was revised in June 2006. The steps are based on maximizing flow through secondary treatment while maintaining a high quality effluent that meets or exceeds MWS's NPDES permitted criteria. The ultimate objective of the SOPs is to maximize the flow to the available treatment units before opening the EFTU gate.

#### Dry Creek WWTP

The Dry Creek WWTP was designed with the following parameters:

A. Average Design Flow	24 MGD
B. Peak Design Secondary Flow (1995)	46 MGD
C. Peak Modified Secondary Flow	63 MGD

The plant was expanded in 1995 with a peak secondary capacity of 46 MGD, capable of receiving flows up to 54 MGD and diverting the excess to the equalization basins. The flow optimization project (See Appendix T for a copy of the Capacity Analysis Report.), completed in two phases from 2003 through 2007, increased the peak secondary capacity to 63 MGD with the ability to accept flow rates of up to 95 MGD into the facility.

The Dry Creek WWTP treats flow from the separated sanitary sewer systems serving portions of northern Davidson County, Goodlettsville, Hendersonville, White House and Ridgely.

Peak flows into the three separate Parshall flumes at the plant headworks are as follows:

Dry Creek	65 MGD
Old Hickory	5 MGD
Hendersonville F/M	<u>25 MGD</u>
Total	95 MGD

During rainfall events, flow enters the two pumping stations and begins to raise the water level in the wet wells. From the time the wet well rises from the normal level of 386 feet until the level approaches the level of 394 feet for the wet weather pumping station to begin service, the plant operators should determine what additional treatment units, if any, should be placed into service to maximize flow through the plant. Use of meteorological data from various internet sites may be useful in forecasting whether or not sufficient flow will be

received to necessitate use of additional treatment units. If a wet weather event is imminent, the plant may bring additional treatment units online before the flow from the Dry Creek pump station increases to the point that these units are needed. If at all possible, plant flow through secondary treatment units should be maximized before flow is diverted to the on-site equalization basins in order to preserve the available equalization volume for large storms.

The Dry Creek WWTP contains two on-site equalization basins totaling 14 MG. Flow may enter the equalization basins from the plant headworks, either before or after the grit tanks, or flow may be pumped directly into the basins from the wet weather pumping station. The maximum flow rate into the basins from the headworks occurs when the basins are empty and is approximately 30 MGD; the flow rate diminishes as the basins fill. However, there is still sufficient capacity to convey over 20 MGD even if the basins are two-thirds full. In order to minimize the chance of a sanitary sewer overflow from very large storms, it is imperative to preserve the capacity of the equalization basins for influent flow rates that exceed 63 MGD.

As the influent flow rate increases during wet weather events, the operator needs to ensure sufficient units are on-line and in service.

There are four tanks in the grit area. The amount of flow treated by the plant should not be limited by the number of grit tanks available for service. If fewer grit tanks are available, then it is better to hydraulically overload the grit tanks than to reduce flow through the plant.

As in the case of grit tanks, the amount of flow treated by the plant should not be limited by the number of primary clarifiers available for service. If fewer primary clarifiers are available for service, then it is better to overload the available primary clarifiers than to reduce flow through the plant. In general, during an intense rain event the influent wastewater will be dilute and contain fewer settleable solids, thus overloading the primary clarifiers will not adversely impact the activated sludge treatment process.

There are six aeration basins with a volume of 1.0 MG each. If one aeration basin is out of service, the corresponding maximum flow rate to provide the same 2.3 hours of detention is 52 MGD. It is desirable to have all 6 aeration basins in service to treat peak flows. However, the treatment plant can still provide adequate treatment for flows in excess of 50 MGD with one basin out of service.

There are a total of nine secondary clarifiers at the plant. The plant can provide treatment to approximately 63 MGD with all clarifiers in service. Losing one of the newer clarifiers, which treat 13.5 MGD each, has a substantial impact on treatment capacity, with peak capacity dropping to 50 MGD. One of the older clarifiers, which treat 3.7 MGD each, being out of service, only reduces peak capacity to about 60 MGD. The treatment capacity of the secondary clarifiers depends greatly on the sludge volume index (SVI) of the mixed liquor in the aeration tanks. The design capacities are based on an SVI of 150. It is possible to treat flows greater than the design capacity if the SVI is less than 150. Consequently, an SVI greater than 150 will likely reduce treatment capacity below the design values. SVI values

will vary greatly during the wet weather event. The average of the SVI values observed before the wet weather event is a good indicator of the settleability that will be experienced during the wet weather event. The plant staff should continually monitor secondary clarifier sludge blankets during wet weather events. If blanket rising is occurring, then the recycle flow rate should be increased to bring the blankets down to near zero. Even during a rain event, it is best to keep a near zero blanket in the secondary clarifiers.

There are 3 chlorine contact tanks. During peak events, the plant has the capability to disinfect at a dosing rate of 102 mg/L-min of up to 63 MGD. During rain events, the fecal colonies in the secondary effluent will be significantly lower than what would be experienced during average daily flow conditions and thus, the plant is capable of realistically treating more than 63 MGD of wet weather flow. The plant should not be concerned with its disinfection capabilities until the flow reaches approximately 70 MGD.

Chlorine contact effluent weirs are good locations to visually monitor final effluent for suspended solids concentration before it enters the Cumberland River. During wet weather events, the effluent solids concentration is often higher than it would be during average daily flow. Determining the effluent solids concentration visually is often deceiving as the concentration may look higher than it actually is. The actual effluent solids concentration can be determined accurately by performing a total suspended solids (TSS) test on a sample taken from the chlorine contact tank weirs. During wet weather events, increased monitoring of the effluent TSS should be performed. During peak wet weather conditions, more foaming may occur at the chlorine contact chambers and care should be taken when taking effluent samples to prevent collection of the foam in the sample as it will cause erroneous sample results (especially concerning fecal colonies) not representative of what is leaving the plant.

### **White Creek WWTP**

The Whites Creek WWTP was designed with the following parameters:

A. Average Design Flow	37.5 MGD
B. Peak Design Secondary Flow (1991)	75 MGD
C. Peak Modified Secondary Flow	75+ MGD

The plant was expanded in 1991 with a peak secondary capacity of 75 MGD, capable of receiving flows up to 100 MGD and diverting the excess to the equalization basins. The flow optimization project (See Appendix U for a copy of the Technical Memorandum), with the first phase completed in 2006, removed hydraulic restrictions within the plant and increased the peak secondary capacity in excess of 75 MGD. Improvements have not been completed yet for disinfection improvements to maximize the amount of flow that can be treated.

The Whites Creek WWTP treats flow from the separated sanitary sewer systems serving portions of western and southwestern Davidson County, and portions of northern Williamson County. Flow is pumped directly to the plant by several pump stations. A summary of the capacities of the pumping stations is as follows:

#### **Rated Pumping Station Capacity**

West Park	60.0 MGD
Whites Creek	11.5 MGD
Bordeaux Hills	2.3 MGD
Bordeaux Hospital	<u>0.7 MGD</u>
Total	74.5 MGD

#### **Peak Pumping Station Capacity**

West Park	80 MGD
Whites Creek	16 MGD
Bordeaux Hills	3 MGD
Bordeaux Hospital	<u>1 MGD</u>
Total	100 MGD

The Whites Creek WWTP contains two on-site equalization basins totaling 10.7 MG. Flow rates in excess of the treatment plant capacity may be diverted to the equalization basins following primary clarification. In order to minimize the chance of a sanitary sewer overflow during very large storms, it is imperative to preserve the capacity of the equalization basins for influent flow rates that exceed the secondary treatment capacity.

The West Park pumping station contains four pumps discharging into three force mains which discharge directly to the Whites Creek WWTP. The rated capacity of the West Park station with three pumps in service is 60 MGD. Under extreme wet weather events all four pumps, if available, will operate and may discharge in excess of 80 MGD to the Whites Creek plant. Once the on-site equalization basins have been filled it may be necessary to reduce the output of the West Park pumping station to match the treatment capacity of the plant. Plans are underway to add an equalization basin in the vicinity of the West Park site to further reduce overflows.

Use of meteorological data from various internet sites may be useful in forecasting whether or not sufficient flow will be received to necessitate use of treatment units. If at all possible, plant flow through secondary treatment units should be maximized before flow is diverted to the equalization basins in order to preserve the available volume for large storms.

As the influent flow rate increases during wet weather events the operator needs to insure sufficient units are on-line and in service.

There are four tanks in the grit area. The amount of flow treated by the plant should not be limited by the number of grit tanks available for service. If fewer grit tanks are available, then it is better to hydraulically overload the grit tanks than to reduce flow through the plant.

As in the case of grit tanks, the amount of flow treated by the plant should not be limited by the number of primary clarifiers available for service. If fewer primary clarifiers are available

for service, then it is better to overload the available primary clarifiers than to reduce flow through the plant. In general, during an intense rain event the influent wastewater will be dilute and contain fewer settleable solids, thus overloading the primary clarifiers will not adversely impact the activated sludge treatment process.

There is more than adequate capacity to treat 75 MGD with one aeration basin out of service, as there is still 3.6 hours of detention time available.

There are a total of ten secondary clarifiers at the plant. The plant can easily provide secondary treatment to 75 MGD during wet weather events, even with one clarifier out of service. There is sufficient secondary clarifier capacity to treat in excess of 75 MGD with all units in service.



## **Section 8**

### **8.0 Program Recommendations**

#### **I. Goals**

The completion of the EPA CMOM Self-Assessment has been beneficial to MWS by assessing the means and methods utilized to perform management, operations and maintenance pertaining to the wastewater collection and treatment system. With this new tool, MWS can better assign the various duties of the division.

This Self-Assessment achieved two goals:

- 1) To provide EPA/TDEC with pertinent information regarding CMOM programs for MWS's wastewater collection and treatment system;
- 2) Clearly define the duties of all of MWS personnel and the roles each of those duties play in supporting the efforts of the MWS in maintaining the wastewater collection and treatment system. The MWS has identified action items that should provide improvements in the overall operations of the system.

#### **II. Recommendations**

The following list identifies these action items and their scheduled implementation dates. Beyond these specific items, MWS is also committed to regular review of each of the CMOM elements to confirm (or establish) program goals and objectives and the methodologies used to determine success.

## Recommendations

Report Section	Program	Recommendation	Implementation Deadline
Section 4, II.b.	Skills Training	MWS will conduct periodic testing, drills and demonstrations of competency of skills	July 2008
Section 4, IV.	Information Management System	MWS will develop and implement a process for reviewing all inspection, maintenance, operations and customer complaint records to identify reoccurring problems. A corrective action plan to address reoccurring problems that develop will be included.	January 2008
Section 4, V.d.	New Construction and Rehabilitation Inspection	MWS will develop standard operating procedures for conducting construction inspections that include methods for documenting inspections and maintaining the documentation. Include training requirements for all inspectors. Other means for managing data to closeout projects will be evaluated.	June 2008
Section 4, V.e.	Acquisition Considerations	MWS will develop and implement standard policy for acquisition of existing sewer systems. This policy will include a plan for bringing sewer systems to MWS's requirements and standards that must be met of the design of the existing sewer before acceptance by MWS and the criteria that will be used for the determination of the financial aspects of the acquisition.	January 2008
Section 4, V.f.vi.	Continuous Sewer System Assessment	MWS will develop and implement standard line condition codes (1 to 5) for use when televising sewer lines. These codes will be manually recorded on TV Inspection Reports.	November 2006
		MWS will implement modified data entry into CMMS to allow entry of the standard sewer line condition codes from the TV Inspection Reports.	January 2007
		MWS will evaluate the software to enter standard defect codes from guidelines in to CMMS.	April 2007

Section 4, V.f.x.	Continuous Sewer System Assessment	MWS will develop and implement standard operating procedures for all assessment practices including technical procedures for carrying out each practice and a means to ensure follow-up on information that is documented during any of the assessment practices. All current forms will be reviewed that are used to determine if the appropriate information is obtained and develop new forms as necessary. A written standard method of prioritization of all assessment practices will be developed.	January 2008
Section 4, V.g.	Infrastructure Rehabilitation Program (OAP)	MWS will develop and implement a management plan to address wet weather conditions once the sewer model is completed.	December 2008
Section 4, V.h.	System Capacity Assurance	MWS will review and update the Wastewater Capacity Management Plan following completion of the conversion of the sewer model.	December 2008
		MWS will complete the conversion of the sewer model into MIKE URBAN software .	April 2007
		The Master Sewer Growth Plan will be renewed and updated every five years.	December 2008
Section 5	Operations	MWS will develop and implement Standard Operating Procedures for critical operations programs. The SOPs shall include a means for follow-up on any items noted.	December 2008
Section 5, I.a.i.	Pump Station Monitoring	The intergration of HSQ and Intrac into a consolidated system will be completed.	October 2007
Section 5, I.a.iii.	Operation and Maintenance Manuals	The feasibility of implementing electronic O & M manuals will be investigated. If it is determined that this is feasible, a new goal will be established for implementation.	December 2007
Section 5, I.b.i.	Reactive Operations	MWS will develop and implement an SOP for tracking the inventory of spare pumps for the smaller pump stations. It will be determined if tracking through CMMS is possible.	December 2007

Report Section	Program	Recommendation	Implementation Deadline
Section 5, IV.	Fats, Oils and Grease Control	A mailing system will be implemented to distribute a notification to all residential customers in a specific area where FOG interference has been a problem. An English/Spanish notification is being developed currently.	February 2007
Section 5, V.	Service Connection/Disconnection	MWS will review current procedures for new service connections and for service disconnections to determine if the procedures need to be updated.	May 2007
Section 6, II.a.	Gravity Line Preventative Maintenance	MWS will develop a method to track the actual footage cleaned from manhole to manhole that does not include footage from multiple passes. This will provide a more accurate measure of the actual footage of the system being cleaned each year.	October 2007
		MWS will develop goals of the actual footage to be cleaned that reflect an analysis of past CMMS cleaning data to determine the actual footage of sewers cleaned.	November 2007
		MWS will evaluate daily goals based on 210 working days per year or 17.5 days/month, which includes estimates for the many reasons crew members would not be available. Goals will be reviewed to reflect potential improvements in planning, scheduling and record keeping, along with fundamentals of continuous improvement. Also, goals will consider that there are certain segments that require more frequent cleaning.	January 2008
		MWS will evaluate ways to set priority on how often various groupings of sewer categories should be inspected with television. Examples, new PVC or recently lined sewers may not be inspected for another 5 to 10 years. However, clay or sewers older than 20 years or large diameter brick sewers would have priority to inspect them within the next five years.	December 2007

Report Section	Program	Recommendation	Implementation Deadline
Section 6, II.a.	Gravity Line Preventative Maintenance	MWS will purchase software for TV units that will allow priorities to be entered into the CMMS.	June 2007
		MWS has recently purchased three new CCTV cameras to inspect and to televise the 224 miles of CSO lines and the other large diameter sewers. Three crews began using the cameras in August 2006. As experience is gained and the process refined of using these cameras, MWS will develop a plan and standard operating procedures (SOP) to inspect a certain amount of large diameter sewers over a projected period of time. The CSO and large diameter sewer televising will be incorporated into the goals for sewer televising for the entire system.	January 2008
Section 6, II.b.	Root Control	MWS will consider development of a policy for resolving root intrusion in service lines with a customer	October 2007
Section 6, III.	Air Valve Preventative Maintenance	MWS will develop standard operating procedures for inspection and replacement of air/vacuum valves.	December 2007
Section 7, II.	Long-Term Control Plan	MWS will update the Long Term Control Plan on an as needed basis.	As needed.
General	All	MWS will develop performance measures for all programs that do not have current measures in place.	December 2007



**METROPOLITAN GOVERNMENT OF NASHVILLE AND DAVIDSON COUNTY**

DEPARTMENT OF WATER AND SEWERAGE SERVICES  
1600 SECOND AVENUE, NORTH  
NASHVILLE, TENNESSEE 37208-2206

April 27, 2007

Mr. Humberto Guzman  
U.S. EPA Region 4  
61 Forsyth Street, SW  
Atlanta, Georgia 30303

RE: Status of CMOM Self-Assessment  
Metropolitan Government of Nashville and Davidson County, Tennessee (MWS)

Dear Mr. Guzman:

As follow-up to the meeting conducted on April 3, 2007, with your office and Department of Justice, MWS is pleased to provide an update on the status of the implementation of the action items identified in the recommendations of the CMOM Self Assessment Report submitted in September 2006.

A copy of the recommendations that were included in the self-assessment report submitted to EPA in October 2006 is provided as an attachment for your convenience when reviewing the information provided in this letter.

In addition to a summary of the status of each recommendation, the attachments to this letter also include examples of several of the programs that are being implemented or that are in draft form.

**Summary of Status of Recommendations:**

**Skills Training -**

A summary of the classes that are offered to MWS staff is provided as an attachment to this letter. In addition to these classes, MWS has established target training requirements for the skills necessary for promotion in several job classifications. In order to demonstrate competency in these skills, an employee is evaluated by a supervisor to establish his/her ability to perform the necessary tasks in a specific job classification. Examples of the Requirements/Curriculum Check Sheets that are utilized for these evaluations are included as attachments to this letter. Also attached is a complete list of the job classifications that have target training requirements established.

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### **Information Management Systems**

MWS has completed the development of a document of customer complaint calls to provide a method for tracking these calls to help identify reoccurring problems. A copy of a recent log is provided as an attachment to this letter.

The next step in completing this recommendation is to develop a corrective action plan of how the reoccurring problems will be addressed. This step is on schedule to be completed by the implementation deadline of January 2008.

### **New Construction and Rehabilitation Inspection**

The first step in completing this recommendation is to review and update the existing inspector handbook. This review is underway; once the review is completed, the handbook will be revised and updated.

The completion of this recommendation is on schedule for completion by the implementation deadline of June 2008.

### **Acquisition Considerations**

A draft of an Acquisition of Existing Sewer Systems Policy has been written and is under review by management, legal and finance at MWS. This policy will be ready for implementation by the deadline of January 2008. This draft policy is provided as an attachment to this letter.

### **Continuous Sewer System Assessment**

MWS tracks the actual footage televised monthly for each employee. The information in the sewer televised spreadsheet is recorded according to whether the work was scheduled or unscheduled. An example of this spreadsheet is provided as an attachment to this letter.

To date, in FY 2007, MWS crews have televised an average of 91,928 LF of sewer lines each month for a total of 1,103,141 LF since July 2006.

MWS has completed the development of standard line condition codes that will be used when televising sewer lines. The definitions for each of these codes are attached to this letter. These codes are entered into a work order in the Information Management Systems (CMMS) to provide a better explanation to the maintenance crews of the repair needed and to the Overflow Abatement Program Managers for system remediation.

Since August 2006, approximately 4,000 mains have had structural condition codes recorded in CMMS.

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MWS is evaluating software to enter standard defect codes with the current Mobile Dispatch Program to determine if similar results can be obtained.

Several SOPs have been developed or are currently under development for all assessment practices. These SOPs include:

- Prioritization Matrix
- Dyed Water Flooding
- Corrosion Defect Identification
- Chemical Corrosion Control
- Manhole Inspections
- Flow Monitoring
- Closed Circuit Television
- Gravity System Defect Analysis
- Smoke Testing
- Service Lateral Investigations
- Pump Station Performance and Adequacy

#### **Infrastructure Rehabilitation Program (OAP)**

A fully dynamic hydraulic model of the MWS sewer system was completed and delivered to MWS in February 2007. Preliminary work has begun on a corrective action plan/engineering report (CAP/ER). This document will be completed in accordance with the schedule developed in the final agreement with EPA.

#### **System Capacity Assurance**

As stated previously, the sewer model was completed in February 2007. The Wastewater Capacity Management Plan is on schedule to be completed by the implementation deadline of December 2008. The Master Sewer Growth Plan is planned to be renewed and updated by December 2008 also.

#### **Operations -**

MWS is in the process of developing Standard Operating Procedures (SOPs) for each of its critical operations programs. These procedures will be ready for implementation by the deadline of December 2008.

One of the SOPs that have been developed addresses the procedures to be used when reporting and investigating potential sanitary sewer overflows (SSOs) from a SCADA alarm. The SCADA alarms are from various past rainfall events that indicate the amount of rainfall expected may be sufficient to cause a potential sewer overflow. A copy of this draft procedure is attached to this letter as information.

The Sewer Overflow Response Plan (SORP) has recently been updated.



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### **Pump Station Monitoring**

The software integration to consolidate the HSQ and Intrac systems has been completed and new radios and RTUs are in the process of being installed now. The system will be operationally complete by July 1, 2007.

### **Operation and Maintenance Manuals**

Electronic O & M (EOM) manuals are being development for the Odor Control and Biosolids projects that are under construction at this time. These manuals will serve as guidelines for structuring EOM manuals for the other treatment plants and pump stations in the future. When Route Services lead personnel are provided with laptops, EOM manuals will be phased in for the sewer pump stations.

### **Reactive Operations**

The development and implementation of an SOP for tracking the inventory of spare pumps for the smaller pump stations is on schedule to be completed by the implementation deadline of December 2007.

### **Fats, Oils and Grease Control**

As described in the CMOM self-assessment, MWS has developed and implemented several programs to assist with the elimination of fats, oils and grease in its sewer system. An SSO Event Tracker is a document that summarizes all locations where there has been an SSO event and lists the primary cause of the overflow. Department guidelines are under development to determine when notifications will be sent to the residences in an area identified as causing obstructions to the sewer system due to fats, oils and grease. This notification will be provided in both English and Spanish. A bill stuffer and door hanger have been developed that explain how to prevent grease from causing blockage in sewer lines. Examples of these are included in the attachments to this letter.

MWS provides grease control equipment (GCE) certification training to grease waste haulers, plumbers, engineers and others interested in receiving this certification to ensure structural and operational capability. GCE training is obtained by attending a no cost class offered by MWS. Since April 2006, 176 certifications have been given.

MWS also has an extensive public and commercial FOG education program. Information is available through various MWS web sites on residential grease recycling. A grease management video and a residential grease recycling video are periodically shown on a local cable access channel.

### **Service Connections/Disconnections**

MWS recently completed the development of a new service connection policy. A copy of this policy is attached to this letter.

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### **Gravity Line Preventive Maintenance**

MWS tracks the actual footage cleaned monthly for each employee. The information entered into the sewer cleaning spreadsheet includes both the actual footage and the footage as a result of multiple passes in a section of sewer line. This information is also recorded according to whether the cleaning was scheduled or unscheduled. An example of this spreadsheet is provided as an attachment to this letter.

From the information in these spreadsheets, a daily total for each employee and a monthly daily average is calculated. The downtime for each employee is also recorded. A grand total of sewer line cleaned is recorded for each day.

An average of 163,427 LF of sewer line has been cleaned each month for a total of 1,470,846 LF since July 2006.

The information that is currently being recorded will be utilized to develop goals for each employee for actual footage cleaned that considers the various reasons an employee would not be available for this task and reflects that some segments of sewer will require multiple passes. These goals are on schedule to be developed by the implementation deadline of January 2008.

A priority system for when a segment of sewer needs to be inspected with television that will consider the age of the segment and the type of materials is in the development stage. This priority system will be completed by the implementation deadline of December 2007.

### **Gravity Line Preventive Maintenance**

MWS is evaluating software to enter standard defect codes with the current Mobile Dispatch Program to determine if similar results can be obtained.

Three CCTV cameras were purchased and began to be used in August 2006 to televise the 224 miles of CSO lines and other large diameter sewers. MWS is developing SOPs for the inspection of these large diameter sewers including a schedule for the inspections. This schedule will be incorporated into the goals and priorities for the entire system as discussed above. The implementation deadline of January 2008 will be met for completion of these SOPs.

### **Root Control**

Two form letters have been drafted by MWS for use when a property owner has failed to maintain the service lines to his property and there is root intrusion into the service line. These letters are currently under review. The review and implementation of this letter will be completed by the implementation deadline on October 2007. An example of each letter is attached to this letter.

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#### **Air Valve Preventative Maintenance**

MWS is compiling a list of all air release valves in the sewer system. The list includes the following:

- MWS ID number
- If the manhole for the valve needs to be pumped out
- If the valve is leaking
- If the piping is galvanized
- Depth to the top of the pipe
- If an isolation valve and main line valve are installed
- If the valve is installed on a tee or if it is direct tap
- If a flagger would be needed or is the valve located on private property

A list of the size and type of valve and the size forcemain on which it is installed at each pump station is in the process of being completed. This information will be used as SOPs are developed for inspection and replacement of the valves. These SOPs will be completed by the implementation deadline of December 2007. A copy of these lists is provided with this letter as information.

An Invitation to Bid (ITB) was recently drafted to replace 18 sewage air release valves in various locations in the MWS system. A copy of the ITB is attached to this letter.

#### **Long-Term Control Plan**

The Long-Term Control Plan is currently up-to-date.

Preliminary work has begun on a CAP/ER. This document will be completed in accordance with the schedule developed in the final agreement with EPA.

MWS is confident the above summary demonstrates the significant effort being made across our organization to complete each of the recommendations identified during the CMOM self-assessment. We are currently meeting the schedule outlined in the report and are ahead of schedule for many of the recommendations. The self-assessment has been beneficial to MWS by evaluating the means and methods utilized to perform management, operations and maintenance pertaining to the wastewater collection and treatment system. The timely completion of the recommendations identified should improve the overall operations of the MWS system and therefore are recognized as being of primary importance.

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If you have any questions regarding the information in this letter or additional questions about any aspect of the operation of the MWS system, please do not hesitate to contact me at (615) 862-4505.

Sincerely,

Scott A. Potter, P.E.  
Director

